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M-STANDARD PERSONAL COMPUTING VOLUME 5 NUMBER 6 MARCH 25, 1986 $2.95

PC MAGAZINE

Exclusive—Compaq's New Portable II
Bigger Performance in a Smaller Package

Monitors in Focus

PC Labs Tests The New Enhanced Graphics Monitors ■ 13 Color Graphics Monitors

- Hard Disk Cards: Fast, Convenient—and Costly
- Programming Column: The Utility You'll Use Every Day

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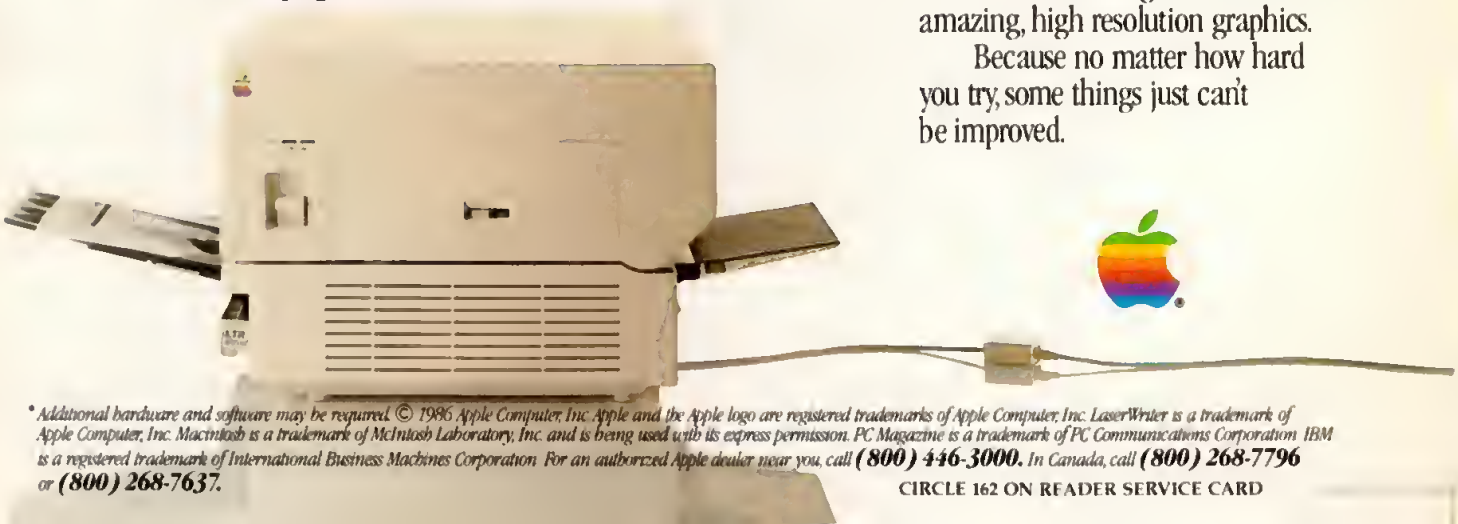

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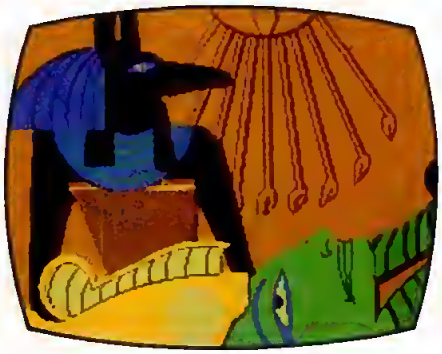

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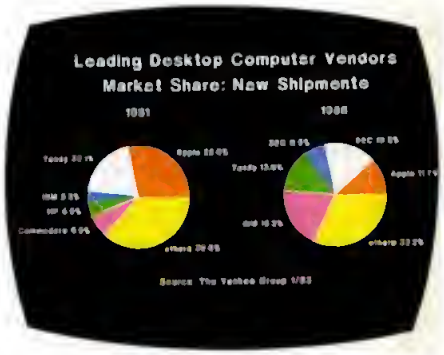

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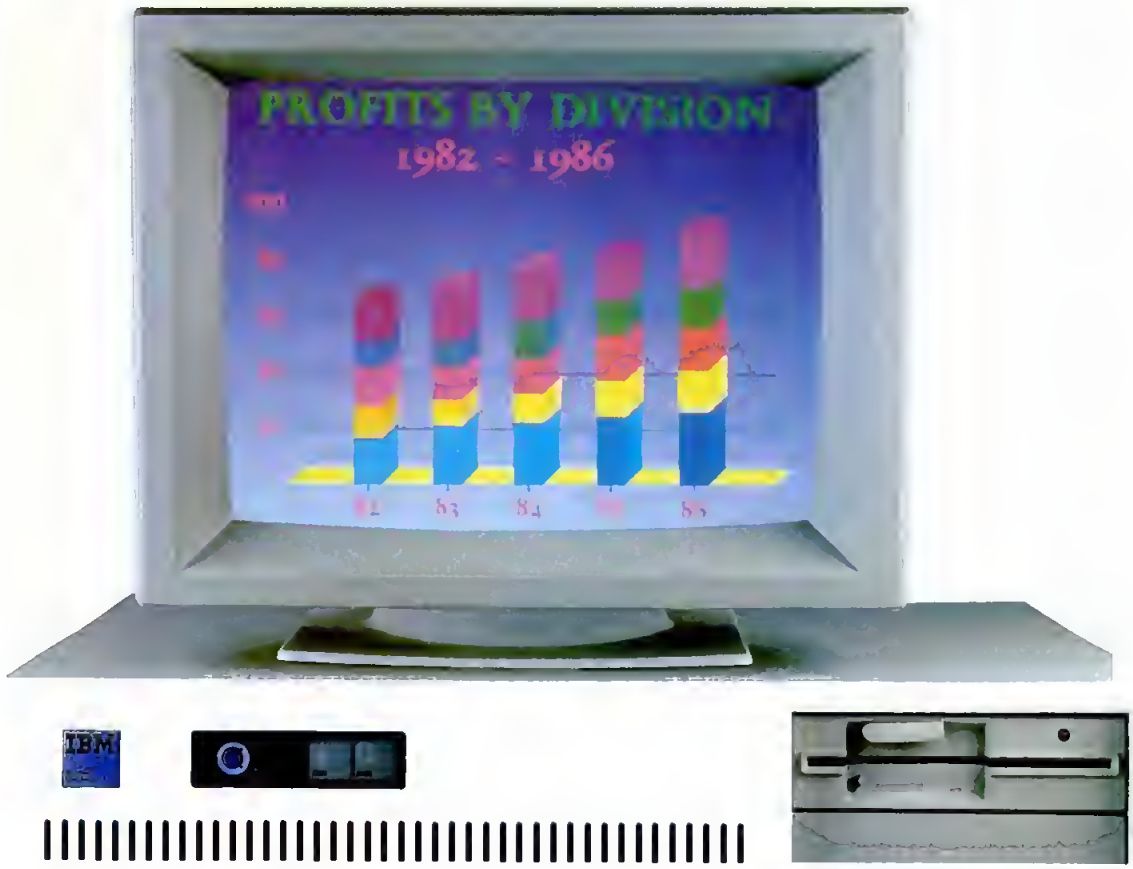

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The EGA Standard: Monitors That Measure Up
Charles Petzold/To take full advantage of the IBM Enhanced Graphics Adapter, you need an enhanced graphics monitor. PC Magazine Labs subjects the first four on the market—IBM's Enhanced Color Display, NEC's JC-1401P3A Multisync, Amdek's Color 722, and Princeton Graphic Systems' HX-12E—to a battery of revealing screen tests and reviewer appraisals. 108

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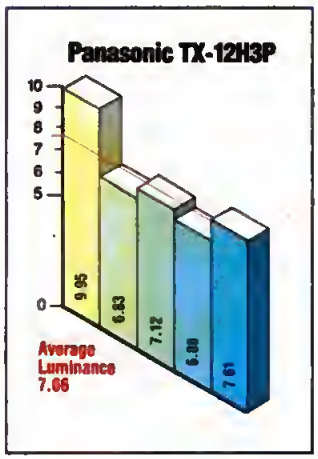

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Craig Cutler

WHAT'S INSIDE

This column is usually devoted to what we call the "middle of the book"—the cover story and other feature reviews that monopolize our four-color budget and custom-design efforts. The front and back of the book—PC News, Viewpoints columns, and Productivity departments—don't receive the attention they deserve. So, when executive editor Paul Somerson (pictured above) submitted his third "must be mentioned in What's Inside" memo, we knew it was high time to find him some well-placed lines.

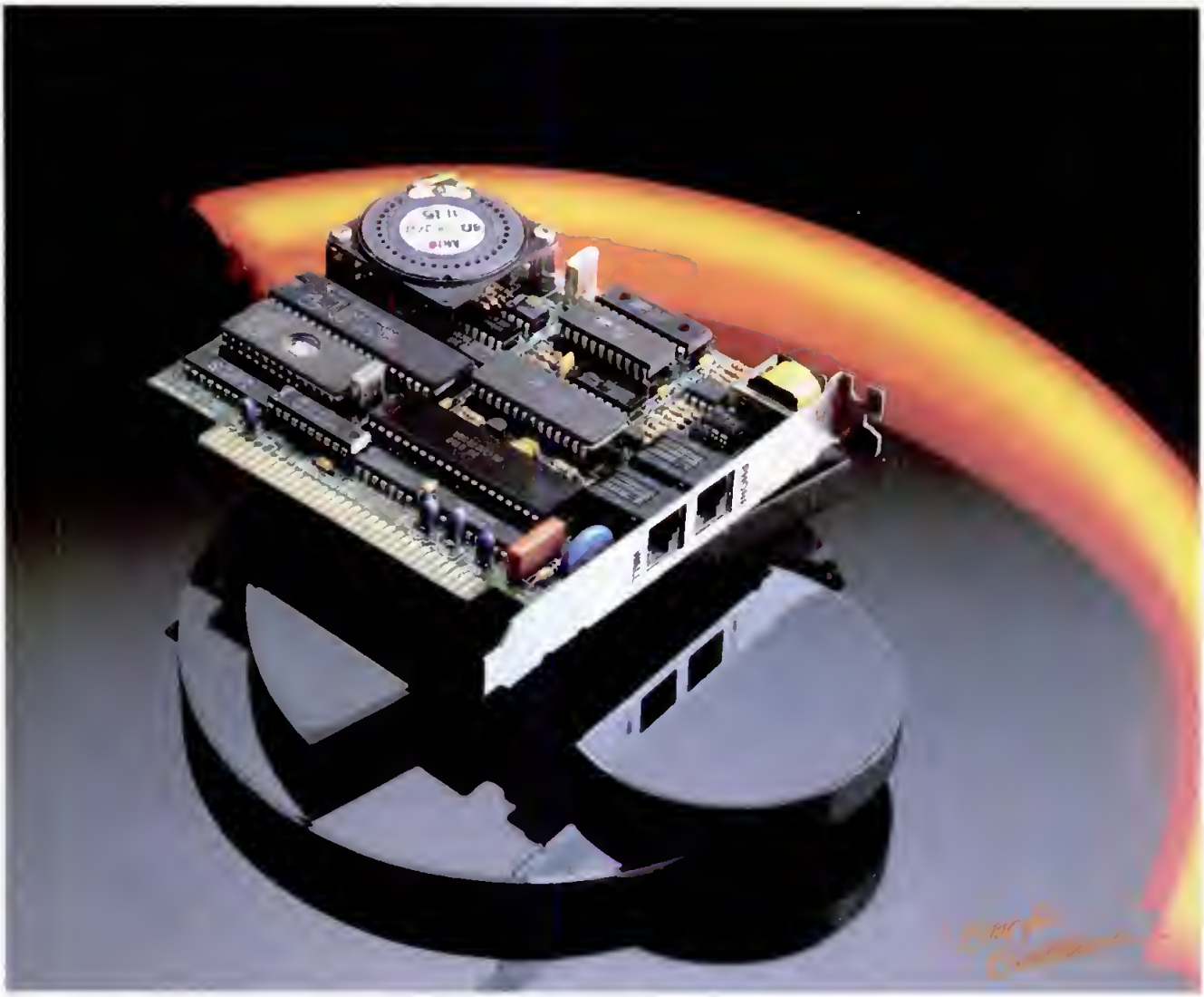
This issue's installment of Programming/Utilities (back of the book, page 253), by Charles Petzold, features a utility Somerson considers so outstanding that he distributed it to the staff via MCI Mail so everyone could have it immediately. BROWSE.COM lets you page backward, forward, and even sideways through any text file, even one created by *WordStar*, while still in DOS. Take it from Paul: BROWSE.COM should end up on everyone's disks.

A brand-new Productivity department debuts in this issue (back of the book, page 237). PC Lab Notes addresses readers who are proficient in one or two areas but need help to become across-the-board power users. The first installment deals with DOS fundamentals; in the coming months, we'll focus on topics like optimal disk management and printer enhancements. We'll show you our favorite DOS and hardware tricks and recommend commercial products that get the same job done with a minimum of fuss.

Jumping to the front of the book, we're pleased to welcome Stewart Alsop, the scion of a distinguished family of columnists, to our Viewpoints section. In his debut column, Stewart challenges Compaq president Rod Canion to design an IBM PC–compatible machine that's as simple to use as Apple's Macintosh (page 99).

Bill Machrone has also had Compaq on his mind. He flew to Houston recently to get an advance look at Compaq's newest computer, which he discovered is not a flashy new machine but a small, important, logical step in the evolution of personal computers. Bill's product report begins on page 147.

Last but not least (despite all the competition from the flanks), the cover story. To prep for the thorny topic of color monitors, product testing editor Mike O'Cone and Bill Machrone visited frigid Chicago to learn how the video wizards at NEC and Zenith test monitors. When they returned, Mike applied his new technical knowledge to creating PC Magazine Labs benchmarks. The results of these precision tests, along with slightly more-subjective reviews of 17 color monitors, begin on page 123—in the middle of the book. ■



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Some of the industry's toughest critics say the nicest things about PARADOX

PC MAGAZINE January 14, 1986

Ansa Software's Paradox commands attention as a high-end database manager. Not only is it fast and easy to use, but it combines the best features of 1-2-3, dBASE, and Infoscope with its own to make one impressive program.

PARADOX A DATABASE MANAGER WITH A FAMILIAR FACE

You need a pretty good product just to break even in the database marketplace, but some people are betting that a new high-end database management system (DBMS) called *Paradox* will do much more than just break even, despite the tough competition.

Ben Rosen, a major backer of Lotus Development Corp.'s successful start-up, has given his financial imprimatur to the fledgling Ansa Software and its flagship product, *Poradox*, in the hope that *1-2-3*'s formula for success will work again. Success seems likely because *Paradox*'s designers. Richard Schwartz and Robert Shostak, have intelligently recognized that the familiar sells. They have borrowed the best elements of the market leaders and combined them into a product that goes beyond the best-sellers while remaining compatible with them. Ansa is marketing *Paradox* as a "better" alternative to popular products and as an "upgrade" for *1-2-3* users who want more DBMS power and *dBASE* users who want a better visual interface and an expanded programming language.

Paradox borrows *1-2-3*'s two-line menu interface and cell format, offers a *dBASE III*-like structured programming language, and takes some advanced features from Microstuf Inc.'s highly rated *Infoscope* DBMS, such as its ability to modify the size and contents of database fields using on-screen graphics. *1-2-3* and *dBASE* users will quickly find themselves at home with *Paradox* and will easily be able to exchange files between the new program and their old favorites.

Paradox is friendly, fast, and loaded with features. It also requires a lot of memory to run, eating RAM and disk storage space like IBM consumes Intel chips. According to its manual, *Porodox* needs 512K bytes of RAM to run, and the program will let you know right away if all that space isn't available. If you have insufficient RAM, *Paradox* will put an error message on the screen and refuse to sign on. You also have to increase the number of files and buffers reserved by the CONFIG SYS command when the system boots, or *Paradox* won't have enough space to work. Forget about RAMdisks of any practical size. You might even find it hard to use print spoolers in RAM or RAM-resident programs waiting to take control of the screen.

You can run *Paradox* on a floppy-based PC, but if you want to create applications that do a lot of computations in arrays, you had better also allow a free megabyte of hard disk storage space for *Paradox* to write the array data. It's a great excuse for upgrading your system because it gives you a lot of power in exchange for all those bytes it eats.

Paradox can do big jobs. A single data table can have up to 65,000 records, and because the program allows multiple tables, you will surely run out of data storage space before the program runs out of data-handling ability. It can do fast, informal inquires into more than one table at once and combine the results for placement into a

Frank J. Derfler, Jr., is a contributing editor of PC Magazine.

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form on the screen or printer. You can use the formal programming language to design input screens and function menus and to write complex data inquires resulting in formal reports.

But *Paradox* queries don't have to be just informal (temporary programs) or formal (permanent programs). You can quickly create permanently recorded inquiry macros tailored to a specific application that you can replay with a single keystroke anytime you need them.

1-2-3 or *Multiplan* users will feel familiar with the *Paradox* two-level horizontal menu, which uses the second line to explain the features highlighted in the top line. The cursor movement and command selection methods are the same as those in *1-2-3* and *Multiplan*, but you bring the menu to the screen by touching the F10 key instead of the slash (/). The F1 (help) key brings up screens of text that follow the *1-2-3* pattern of allowing you to branch to explanations of other related subjects. Ansa has even supplied a hard plastic *Paradox* function-key template (similar to the one Lotus supplies with *1-2-3*) that describes key assignments in the Alt and unshifted modes.

Like *1-2-3*'s own primitive database, *Paradox*'s primary interface uses a spreadsheetlike format that lets you see the horizontal and vertical relationships of records (rows) and fields (columns). Some database systems only allow you to write lines of program code in which you describe these records and fields in words. *Paradox* shows you the columns and rows and allows you to enter, retrieve, and manipulate data according to these horizontal and vertical relationships.

Advanced *1-2-3* users will appreciate *Paradox*'s ability to build macros. The Alt-F3 key combination tells the program to record the keystrokes that follow. You can run through a complex sort-and-retrieval using the menu or issuing commands, and the program will capture every keystroke. Keying in Alt-F4 plays the recorded keystrokes back. A menu selection lets you attach the "recording" to a particular key combination so that you can replay it any time you need it.

Although *Paradox* has many features in common with *1-2-3*, it's not just another *1-2-3* clone. Nor does it do all that *1-2-3* does by any means: *Paradox* has math functions, but it does not claim to be a spreadsheet. *Paradox* doesn't have *1-2-3*'s graphics or its ability to easily create extended formulas that apply to only one cell.

Paradox goes beyond *1-2-3*'s database capabilities to match such full-function DBMS programs as *dBASE III*. It can work on more than one table at a time and on more data than can be held in RAM. It also has a full-featured procedural language, the Paradox Application Language (PAL), which has a syntax and program structure similar to that of the *dBASE* language. PAL's commands are often identical or quite similar to the corresponding *dBASE* words, but it has more of them.

If you are a *dBASE* programmer and you keep Ansa's cross-reference guide at your elbow to tell you that INPUT has become ACCEPT and LIST has become VIEW, you'll be able to start writing PAL code right away. You will probably like *Paradox*'s built-in functions, which let you check the status of a specific disk drive, find the name of the current active directory, and check the keyboard buffer for characters that might otherwise be lost. You might also find uses for the *Paradox* features that build arrays and perform trigonometric and statistical functions, including logarithm arccosine, arctangent, maximum, minimum, average, and standard deviation.

PAL has excellent functions for controlling the printer and constructing data input or report screens that take full advantage of the PC's display, whether color or monochrome. It is a very complete DBMS language, but unlike other such complete languages as SQL, it's easy for someone raised on BASIC or Pascal to use.

Paradox's high-quality screen displays help you edit data, change the way answers to your inquiries are displayed, and actually make the inquiries. A unique image-scrolling feature also lets you see how you got to where you are and go back through the looking glass to change what you did.

This on-screen editing is a real boon to DBMS users accustomed to programs that let you review and edit data only record by record, which is like sorting through a stack of 3- by 5-inch cards one at a time. *Paradox* lets you take a full-screen look at your database and then move around to spot errors or change data with an on-screen editor. Edited data becomes a permanent part of the database.

You can also use the screen-display command ALTER to change the configuration of the displayed tables you get as answers to data queries. If you have made a query into the database and the answer is a large display of records, *Paradox* will allow you to change fields around, alter the size of fields, and generally reconfigure the resulting table to meet your immediate needs. Unfortunately, *Paradox* will not allow you to make permanent changes to the configuration of the database through on-screen manipulation as *Infoscope* will and it doesn't use color as well as *Infoscope*, but ALTER is valuable for displaying practical answers to your database queries.

The program also has an interesting screen display that will help you make informal queries. *Paradox* displays an image of the fields available and allows you to place a check mark (created by special programming of the F6 key) in the fields holding data you want to see. You can also set conditions in the fields such as >= 10,000 or = Smith. You can put conditions on every field or just put limiting conditions on one field: >= 100, <= 500 will show you all records with amounts between 100 and 500 in that field.

This informal query procedure lets you set either-or conditions such as "live in California or drive a BMW" and have the flexibility to handle upper- and lowercase entries and other variables. The process is easy to use and fast.

Putting data into *Paradox* is a joy. *Paradox* has an excellent data import and export function that can easily and quickly handle *1-2-3*, *Symphony*, *dBASE II* and *III*, *PFS:FILE*, and .DIF (*VisiCalc* and others) and ASCII files. I created and exchanged files with *1-2-3* and *dBASE III* with no problems. Importing the PC Magazine Labs test files took only a few minutes. *Paradox* even found the two records with incorrectly formatted data and presented them for correction.

Unlike the frustration of report writing in many other DBMS languages, *Paradox*'s easy information retrieval was a pleasure. After a few retrievals for training, I could select four or five fields from three data files and have them correlated, sorted, and displayed in less than 2 minutes.

To produce reports summarizing or manipulating data drawn from several files, I used a *Paradox* menu selection called Report. The Report function displays the form on the screen and allows you to insert and write the specifications for new fields as quickly as you could in a spreadsheet. It takes about 2 minutes to make the request and less than a minute for it to appear on the screen.

I performed all the PC Magazine Labs benchmarks using *Paradox*'s menus and special function keys—I didn't have to use PAL for any of these retrievals or reports. I am convinced that even an expert *dBASE* programmer could not have created the application more quickly in code than I did on the screen. However, anyone using PAL would be able to do more complex mathematical functions and format printed reports better in code than I could on the screen. Programmers could also create better security protection for files and screens that make better use of color.

Ansa's copy-protection scheme gives you a choice between flexibility and ease of use. If you run an installation routine, you can put *Paradox* on your hard disk and not have to keep a program disk in drive A for verification when you want to fire up the program. If you install the program, you will have to uninstall it before you can move it over to another machine. (The data files you create are portable.) But if you want more flexibility, you can just move the program files over to the hard disk and keep the original disk in drive A for verification when *Paradox* signs on. In this way, you can have one copy of the program that you can run at home or in the office—but not in both places at once.

Paradox's excellent manuals include clear illustrations of the screen and keyboard and references to other related topics. I particularly like the two slim volumes of special information included for *1-2-3* and *dBASE* users. Armed with the appropriate volume, anyone familiar with either of these programs can be effectively using *Paradox* in minutes.

I was able to do complex work with *Paradox* minutes after I inserted the first disk, but after spending 7 full days working with the program, I was still finding important features. *Paradox* is obviously the result of years of effort. It shows the signs of true class in the way it smoothly handles errors (polite English prompts) and quietly keeps files of changed data so that you can recover from dumb mistakes.

To qualify as a Category 4 database under *PC Magazine*'s classification scheme, a DBMS must have a method of doing informal queries with Boolean conditions, such as IF, THEN, or ELSE, and it must also have a procedural language. The procedural language must contain structures such as loops and GOTO statements and enable the programmer to build applications that nonprogrammers can use interactively to enter and maintain database files. *Paradox* meets these criteria.

Category 4 products must also in some way set a standard in microcomputer database design. *Paradox* meets this test through its provisions for on-screen visual interaction with the database and its attempts at compatibility with widely used programs from other companies.

Other members of Category 4 include *dBASE III*, *KnowledgeMan*, *Power·Base*, and *INFORMIX*. On the whole, *Paradox* can match or exceed the performance and features of any of these programs. It does, however, lack the natural-language features of *KnowledgeMan*, *INFORMIX*, and some other Category 4 programs that let these programs parse phrases entered in ordinary English looking for important discriminating words while ignoring unimportant articles and adjectives. *Paradox* substitutes an efficient visual checklist for typed queries and neatly sidesteps the need for natural-language recognition.

Paradox is impressive on the surface, and the deeper you go, the more the feeling grows. It is fast, capable, easy to learn and use, and well documented. It also costs a steep $695 and takes a fully stuffed PC to run. This price (the same as *dBASE III*'s) shows that *Paradox* is aimed at Ashton-Tate's heart. Even at those prices, neither product is perfect for every application, but *Paradox* is easy to use and offers high-end programming power that should attract the attention of many corporate, government, and institutional buyers. ■

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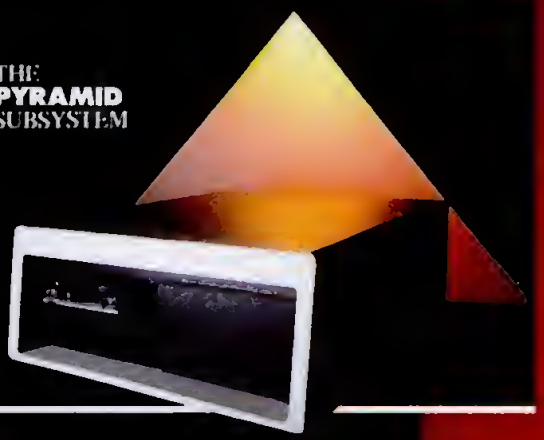

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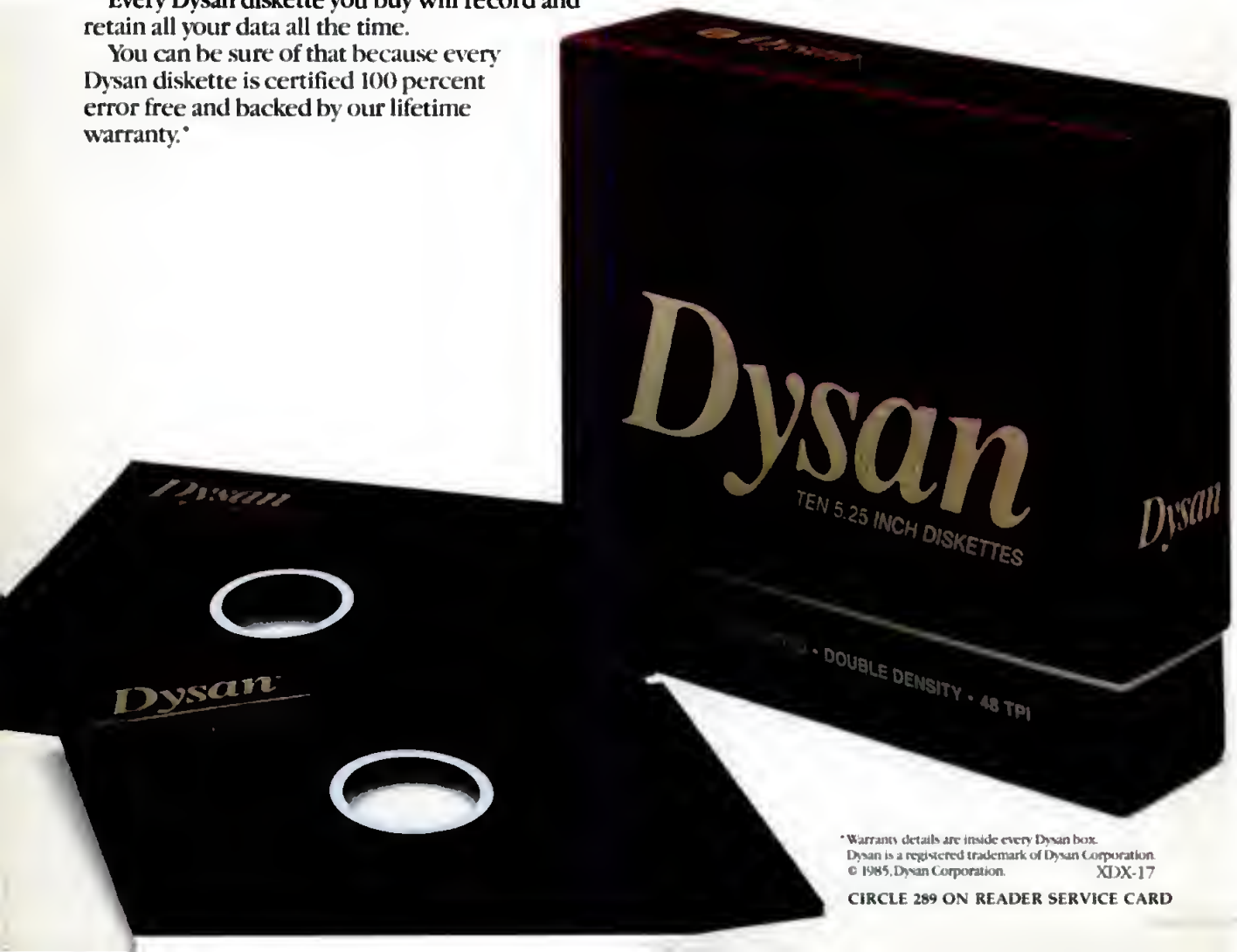

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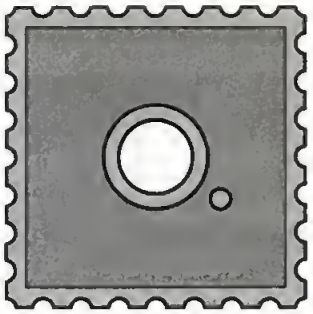


A LICENSE TO CALL

While presenting a new and unique product, the article your magazine carried on wireless modems ("Modems Take to the Airwaves," *PC Magazine*, Volume 5 Number 1) contained much misinformation that could lead your readers into serious conflicts with the federal authorities.

The modem M. David Stone described operates as a radio transmitter in the 72- to 76-MHz radio band with an output power of 1 watt. Federal law (Communications Act of 1934) requires the users of this equipment to file for a license under Part 90 of the Federal Communications Commission Rules and Regulations. Unlicensed operation is punishable by severe fines and possible imprisonment.

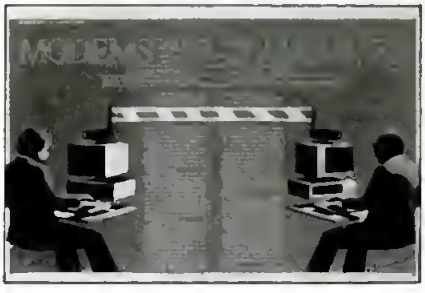
The user must apply for a specific frequency within the 72- to 76-MHz band. Stone's article states that the user can "simply switch to an unoccupied frequency." Wrong! Frequencies are assigned by the FCC and the user must remain on the assigned frequency.

The article states that to obtain extended range between the wireless modems, the whip antenna on the unit can be removed and an improved antenna such as a magnetic-base or building-mounted antenna employed. Wrong! FCC rules state that the antennas "must be directly mounted or installed upon the transmitting unit." [Section 90.257 (B) (2)].

The article, in my opinion, is also misleading regarding the potential of interference. While the manufacturer was correct in stating that interference may be received from remote-controlled cranes (popular in any large factory setting), the modem shares its radio channels with a large number of other users, such as high-powered radio links tying together the rapidly growing networks of radio paging systems (beepers), police and fire alarm call-box systems, and railroad control systems. These uses are growing as industry and government implement new technology to avoid increasing land-line costs.

Not mentioned, however, was the interference that wireless modems can create in television reception for the general public. The frequencies the modems use are extremely close to television channels 4 and 5. So close, in fact, that the FCC has set up special requirements obligating a user of this band of frequencies to engineer each system to prevent interference, as well as to be responsible "at his own expense" for correcting any and all television interference [Section 90.257 (b) (1)].

Hopefully this information will warn the potential purchasers of these devices to be wary of products that may jeopardize



them. The FCC and FBI take illegal radio operations very seriously, and while the "first offender" is rarely put in prison, most certainly the equipment (modems, computers, and peripherals) would be confiscated.

David I. Barquist
Hartland, Wisconsin

M. David Stone replies:

Mr. Barquist is, of course, correct in pointing out that the FCC requires registration and licensing for the EST Wireless modem, but this requirement is not all that different from other FCC regulations that require registration and notification to the phone company for use of standard modems. And just as the manuals for standard modems inform the user of the need for notifying the phone company, so do the EST manuals inform the user of the need for licensing.

According to the EST documentation, "The owner should fill out form 572 and retain it in his possession to have immediate authorization to use the modems. The applicant should then complete form 574 and file it with the FCC. There is no fee involved with form 574.... It should be noted that only one form is needed for a company for its total system. Contact your local FCC branch office for the necessary forms."

According to EST president Tom Kirchner, although the FCC regulations do limit use of the modem to specifically licensed frequencies, they also permit licensing for multiple frequencies. As for antennas, according to Kirchner, current federal regulations state that the antenna must be directly mounted on the transmitting unit except in portable applications, where the two can be "separated for mounting convenience."

Kirchner points out that the ESTeem modem is by nature a portable device. Finally, as a former ham radio operator, I can testify from personal experience that television interference is always a possible problem when dealing with radio transmission, but then my IBM computer and my Hayes modem also ruin my TV picture, and I'm the one who's responsible if someone complains.

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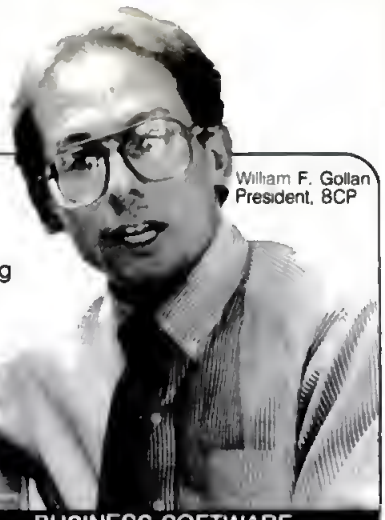

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■ LETTERS

SUBSTANDARD-BRAND DISCUSSION

Paul Somerson's editorial (From the Editor's Screen, *PC Magazine*, Volume 5 Number 1) calling for the establishment of standards for software operation is far off the mark. The field of software engineering is far too young for a human interface standard to emerge. Setting such a standard now will only stifle whatever creative urge is left in our "play it safe" society.

Citing IBM's human-factors engineers (the same people who brought us the original PC keyboard, the PC*jr* keyboards, and the AT keyboard) as paragons of perfection is laughable. Look at the PgUp and PgDn keys for example; why does the PgDn key move the screen window down the page instead of moving the page down in the screen window? That key really should have been marked "DnPg." It appears that folly becomes wisdom after a critical share of the market is captured.

Anyone who doesn't try a software package out before buying it gets just what he deserves; any so-called "power user" so insecure as to object to learning something new should try psychotherapy, not try to force the rest of us into his intellectual straitjacket.

Any new tool should be evaluated on its own terms; the most important question being "Does it work better than the old tool?" Mr. Somerson would have us use computers where the input device consisted of rows of beads strung on wires.

The analogy drawn between the standardized controls on an automobile and the user interface of a computer is false. If one hits the accelerator while trying to brake in a car, the result is a crash and possible death; hitting the wrong key on a computer might result in a little lost time (assuming one has backed up his work).

Mr. Somerson does have one point right; he says, "But some real-life software engineer...put his money where his mouth was." If this or any other product is so terrible, word will spread (it would have spread far faster if he had had the courage to name it), and the product will die a well-deserved death.

William Perlis, Ph.D.
Pelham, Alabama

Paul Somerson replies:
The above exercise in looking-glass logic

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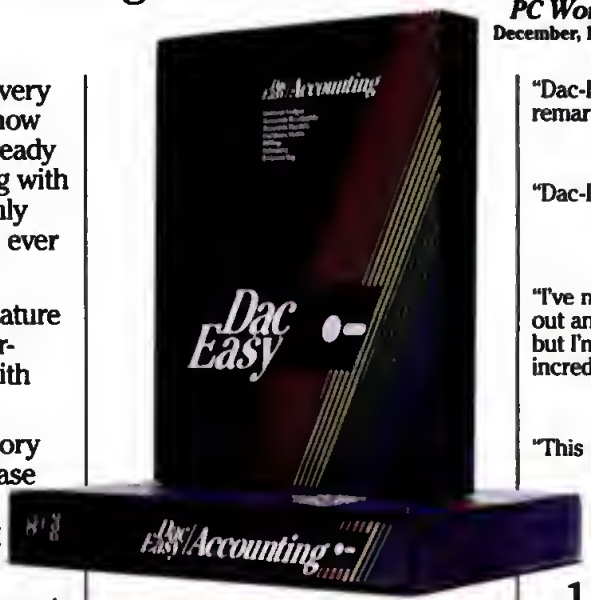

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■ LETTERS

pretty much speaks for itself. Castigating the superb PC AT keyboard because of some crackpot notion that PgDn really ought to be DnPg is like shunning Ferraris because you don't like the length of the serifs on the letters in the nameplate.

The bald assertion that setting standards will somehow stifle creativity is absurd. Operations such as moving the cursor, entering responses, getting help, opening and closing files, and, yes, even scrolling up and down the screen, are common to many software packages, but the keys that trigger these functions aren't. And it's worse when software abandons the few sensible conventions that have emerged; the subject of the Editor's Screen column to which Dr. Perlis refers was a program that among other transgressions relied on a key other than the one marked "Enter" to enter data, and used the PgUp key to do a "poge down."

Designers should exercise creativity in the power and ability and speed and friendliness of software, not in the redefinition of the Enter key. Choosing a sensible keyboard standard and sticking to it does not stifle anything other than unnecessary input errors. In fact, user creativity suffers in the absence of such standards. Keying in information should be automatic and invisible to the user; it's when he has to stop and figure out preposterous new keyboard interfaces that a user's concentration—and creativity—is shattered.

This is precisely why it's so difficult to "try a software package out before buying it." Manuals are so awful, good tutorials so rare, and software so unintuitive and nonstandard that it's common for users who have been plodding away at a particular package for a whole year not to have learned all the features. So how does Dr. Perlis expect prospective purchasers to do so in a crowded store in an hour or two? It's hard enough to even find a store that will let you sit down in front of a terminal, rip open a package, and play with it sufficiently. And salespeople are often far more expert on which software company is offering them a cruise to Martinique for touting its products than haw to get the product to boot up. The "something new" that users desperately want to learn is not a laughable new way to move the cursor or enter data—it's how solid new software features can help them work more powerfully and efficiently.

And it's faulty reasoning to leap from the obvious assertion that you shouldn't buy a new tool unless it works better than the old one, to the screwball notion that anyone would prefer beads and wires to IBM's sublime keyboards. IBM has spent more time than just about anyone else testing and refining the process of typing, and many of its keyboard conventions have become de facto standards in the micro industry. The trouble is that we need more such standards, and that some designers persist on thumbing their noses at the more widely accepted ones.

Contrary to Dr. Perlis's denial, the analogy between the standardized controls of a car and the interface on a computer is accurate. It would be hard for the driver of a car with an accelerator where the steering wheel is, a brake where the directionals normally are, and steering pedals instead of a wheel to crash fatally, since he probably couldn't get the thing out of the showroom lot. And while an errant keystroke probably won't kill you, it could get you fired or kill your company if you enter incorrect financial data into a spreadsheet or erase all your company's records with an accidental "Y" in response to a hard-disk Format verification.

*By the way, we did "have the courage" to name the aberrant product. For several months PC Magazine Labs scrutinized the 86 legitimate word processors on the market, and we published the results in our blockbuster issue (*PC Magazine, *Volume 5 Number 2). When we test products, we don't pull any punches. But we also don't release test results before publication. From the Editor's Screen appeared in the issue before the blockbuster word processing issue.*

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asm	conc	ferror	getdseg	iscntrl	open	repmem	strcmp
asmx	cos	fflush	getd	isdigit	outp	rewind	strcpy
atan	cpystr	fgets	putd	islower	peek	right$	strlen
atof	creat	fileno	getdate	isprint	perror	rindex	strncat
atoi	cursblk	filetrap	gettime	ispunct	poke	rmdir	strncmp
atol	curslin	find	getl	isspace	poscurs	scanf	strncpy
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biosx	curson	fputs	setmode	left$	putchar	setdate	toupper
calloc	delete	fread	gets	len	puts	settime	ungetc
ceil	drand	free	getw	log	putw	setjmp	ungetch
cfree	exec	freopen	heapsiz	log10	rand	setmem	unlink
chain	execl	fscanf	heaptrap	longjmp	read	sin	write
character	execv	fseek	hypot	lseek	readattr	sound	writechs
chdir	exit	ftell	index	malloc	reach	sprintf	xmemberg
chmod	exitmsg	fwrite	inp	alloc	writech	sqrt	xmemend
clearerr	exp	getc	insert	mathtrap	readdot	srand	xmemget
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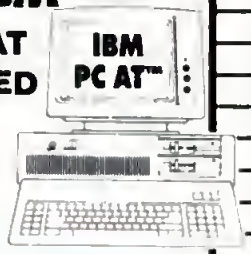

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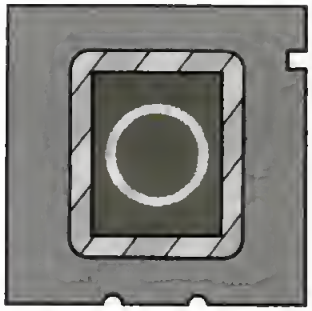

PC ADVISOR

The PC Advisor helps readers choose the best hardware and software products to meet their specific needs.

SPLITTING SCREENS

I'm looking for a low-cost word processing program that will allow me to split a screen in half vertically and type independently on both sides. Any suggestions?

Vincent Page
Allegany, New York

*Many word processors allow you to split a screen; in our recent special issue, "The Business of Words" (*PC Magazine, *Volume 5 Number 2), 18 out of the 57 general-purpose word processors reviewed allow split screens.* PC-Write 2.55 *at $75 (Quicksoft, Seattle, WA 98109; (206) 282-0452) is the best value if price and windowing are major considerations.*

But I don't think you're after split-screen editing in the normal sense, which means bringing up two or more distinct files at the same time. These files remain separate during and after editing. To annotate text in the margins, you need column formatting. Very few word processors offer it, and of those that do, most are very restrictive. WordPerfect *is not cheap ($495 from Satellite Software International, Orem, UT 84057; (801) 244-4000), but it is clearly best for the kind of marginal notation you want to do and it offers so many other features that you may find it's worth the investment.*

ONE-HAND TYPING

Quite some time (a year or two) ago, I read about an input device for people who have the use of only one hand. It's a substitute for the traditional keyboard and has only four or five keys that are used in different combinations to transmit all of the letters of the alphabet.

I would now like to pass this information on to a one-handed friend but have misplaced the promotional material.

Karen Kemp McMillan
Ladysmith, British Columbia
Canada

You must be thinking of Microwriter, which we reviewed in our June 26, 1984, issue (Volume 3 Number 12). However, I'm afraid you—and most of the others who could have benefitted—have waited too long. This $499, six-key device has disappeared from the market, along with its manufacturer. It was a great idea that didn't generate enough interest.

There are other alternatives. KeyTronic's KB5152V keyboard (KeyTronic Corp., Spokane, WA 99214; (509) 928-8000) accepts voice input and comes with a headband-mounted microphone, software, and a footpad to toggle between voice and keyboard input. At $1,495 it's a big investment, but it could make a world of difference for the one-handed typist. We reviewed it in PC Magazine, *Volume 4 Number 14, and found that it could make life much easier for anyone having difficulty in mastering a keyboard.*

■ MindReader brings the macro concept to ordinary typing and "remembers" commonly entered words and phrases in an effort to save keystrokes.

*To tailor a standard keyboard for one-handed use (and this includes people who may need to keep their other hand free for a telephone or machinery), there are software fixes that require more work and fewer dollars. First, try using HANDICAP.COM, a BASIC program that we printed in the Programming column (*PC Magazine, *Volume 3 Number 1). HANDICAP.COM solves the problem of Alt, Ctrl, and Shift combinations by enabling you to turn these keys on or off with a single touch.*

For a more comprehensive approach, try one of the many macro programs on the market, such as SuperKey *(Borland International, Scotts Valley, CA 95066; (800) 255-8008; $69.95),* ProKey *(RoseSoft, Seattle, WA 98105; (206) 524-2350; $130), or* Keyworks *(Alpha Software, Burlington, MA 01803; (617) 229-2924; $89.95). They'll allow you to tailor the keyboard to your own needs. If you need help in choosing, see our review of six macro utilites, "Power Plays at Your Keyboard" (*PC Magazine, *Volume 4 Number 22).*

A new word processor that attempts to guess what you're going to type, MindReader *(Businessoft Inc., Annapolis, MD 21401; (301) 263-1962; $189) is worth considering. It brings the macro concept to ordinary typing and "remembers"*

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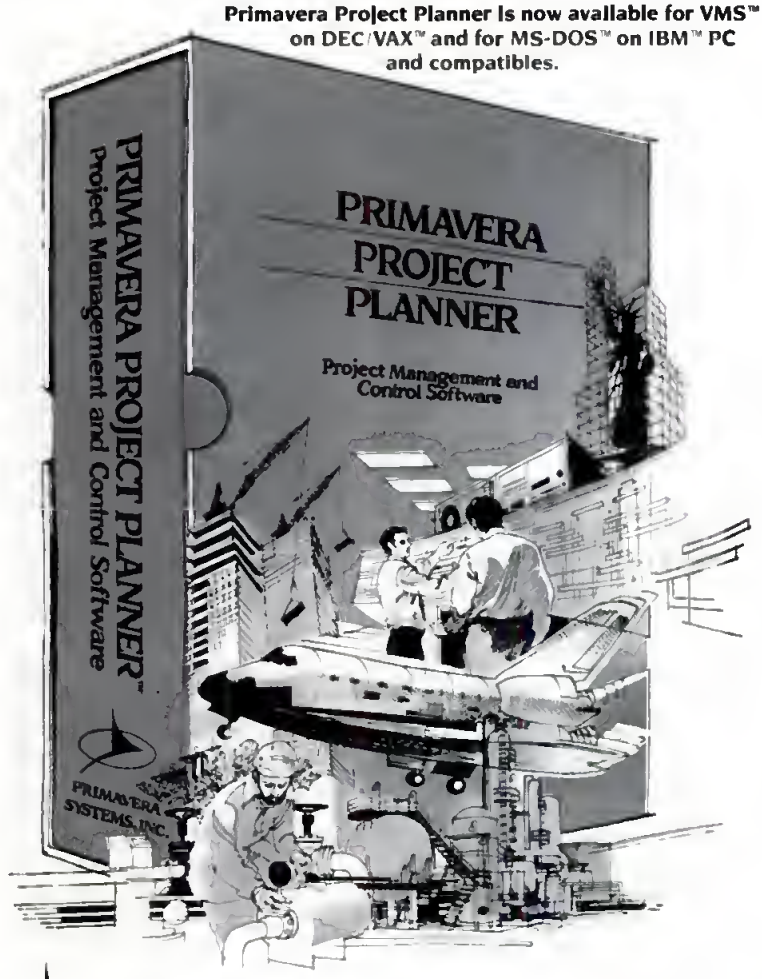

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■ PC ADVISOR

commonly entered words and phrases in an effort to save more than half the keystrokes needed in ordinary correspondence. When you turn on its "Word Complete" feature, a window pops up after you've entered a few letters, with a guess at what you want to say. Either say "yes" or continue with your thoughts. Sounds like a game, but it could be a terrific help to the one-handed typist.

THE MILITARY OPTION

I am currently working on a project to provide a portable, briefcase-sized computer, such as the GRiD Compass II, for the Commander in Chief, United States Army, in Heidelberg, West Germany, but I have not been able to locate a vendor or

■ GRiD keeps in mind the brutal treatment the military is likely to have in store for its GRiD Compass.

the address of the company that makes it.

J. Ned Burford
HQ U.S. Army–Europe and 7th Army

*When we reviewed the GRiD Compass back in August 1983 (*PC Magazine, *Volume 2 Number 3), we called it "a real headturner, the Bugatti of bits." It's a very powerful portable with a price to match—circa $8,000 depending on configuration. It's built so well because GRiD keeps in mind the brutal treatment the military is likely to have in store for it. Few businessmen need such a rugged machine, so GRiDs are rather rare outside the military. GRiD is located at 2535 Garcia Ave., Mountain View, CA 94043; (800) 222-4743.*

ASK THE ADVISOR

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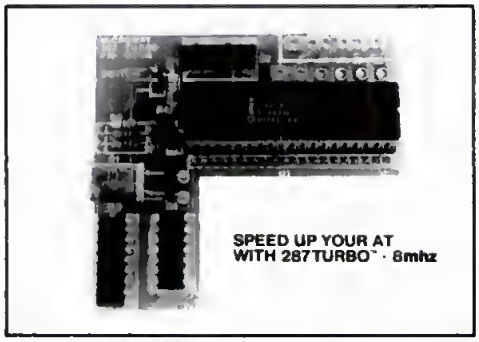

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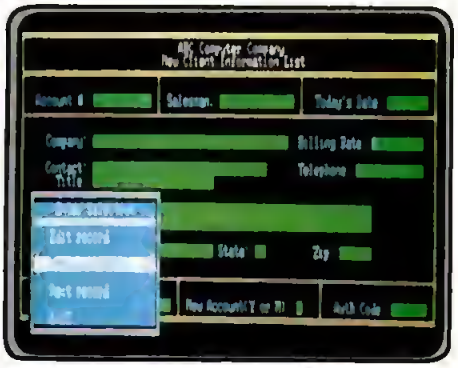

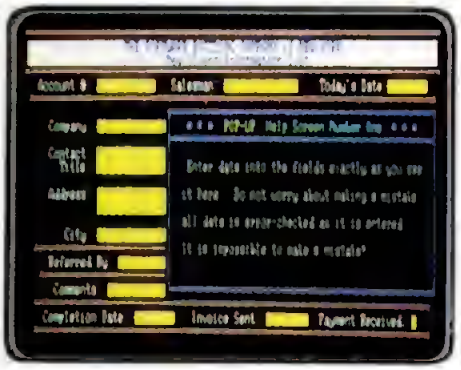

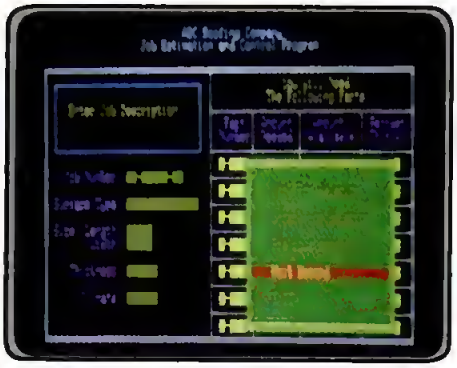

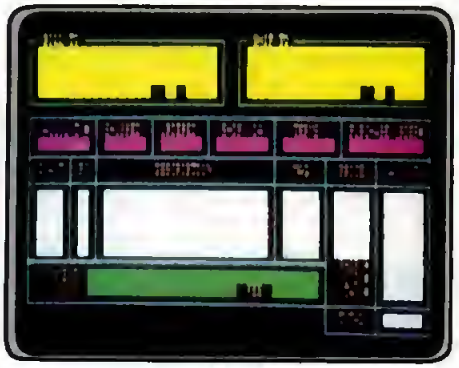

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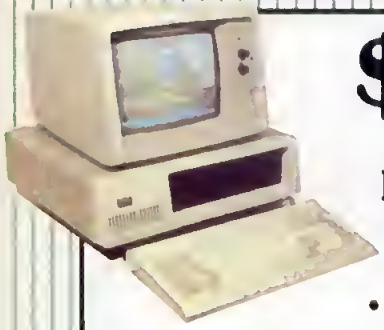

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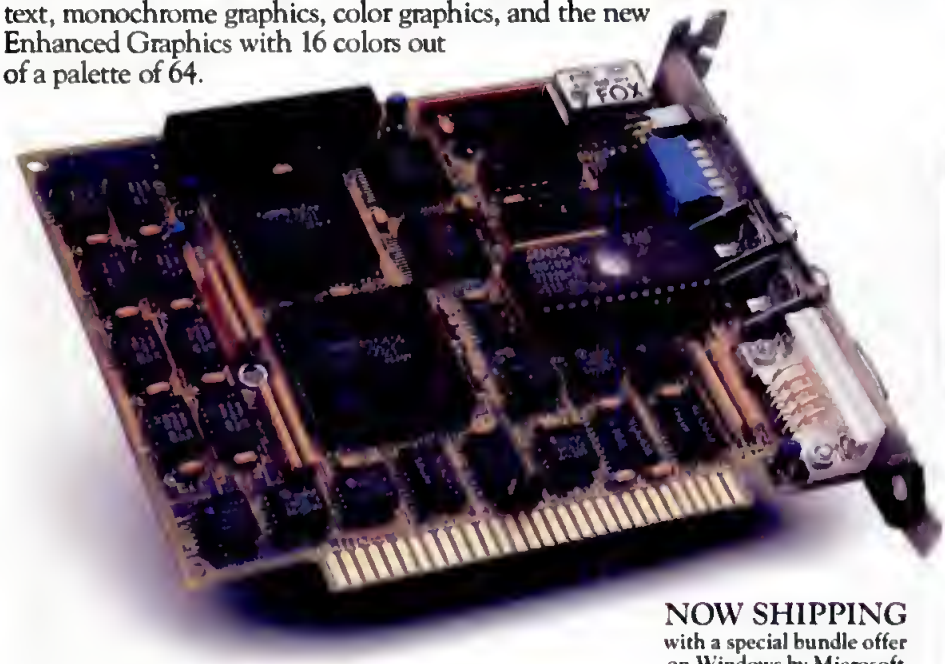

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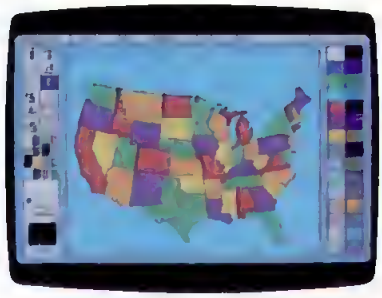

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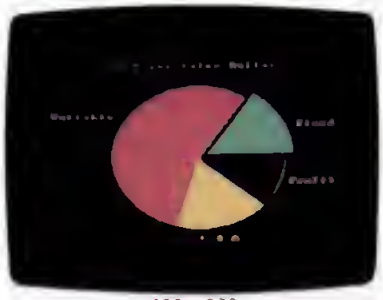

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PC MAGAZINE NEWS

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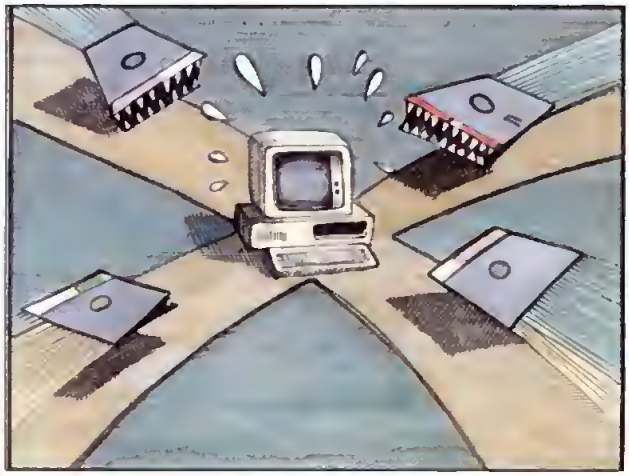
Memory-Resident Programs Jockey for RAM Positions

ANALYSIS

Software developers look to Microsoft to mediate the dispute over conflicting program standards.

BY VIRGINIA DUDEK AND CHARLES BERMANT



You know the story. You're typing away in your word processor or crunching numbers in your spreadsheet and you call up your favorite "Swiss army knife" pop-up desktop utility program. After using the calculator, you invoke a keyboard macro program, then switch to a memory-resident outliner, then use the appointment calendar—and the system crashes. Your data is history.

What happened? Keyboard-hungry, RAM-resident utilities programs are competing with foreground applications programs that, because of the design of current versions of DOS, can't share memory with other programs.

"Right now, DOS does not give manufacturers a good set of features for writing programs that can locate each other in memory at any point in time," says David Rose, director of product planning at RoseSoft in Seattle.

No Problem Too Big

A group of vendors who lead the market has recently risen to the occasion to solve the dilemma. They include Philippe Kahn of Borland International, David Rose of RoseSoft and John Socha of Peter Norton Co.

(continued on next page)

Tandy 3000 Has Right Features

FIRST LOOK

Power and price make this AT-compatible a serious contender in the heavyweight desktop division.

BY CRAIG L. STARK

After wasting years learning that nonstandard software/hardware requirements get you only tank-town fights, Tandy Corp. has finally stepped into the main corporate arena with its Model 3000, an AT-compatible with an 8-MHz speed and a trim figure that makes you wonder if IBM's champion looks a little paunchy at the price.

The Tandy 3000 is built around an 8-MHz version of the AT's 80286, with a 5-MHz 80287 math coprocessor as an optional feature. Its operating environment consists of a compatibility-proven Phoenix ROM BIOS and MS-DOS 3.1. A CMOS RAM clock/calendar (battery backup) is standard, and both MS BASIC 3.1 and Tandy's *Desk Mate* are also supplied. (The software package adds $99.95 to the basic unit.)

The 3000 that PC Magazine Labs received for testing had a 1.2-megabyte floppy disk (the minimum, $2,599 configuration). We requested and in-

(continued on page 35)

Tandy's 3000 offers strong competition for the more expensive IBM PC AT. Initial tests show it to be faster than the AT, yet highly compatible.

Illustration: Doug Jamieson

RAM Positions

(continued from preceding page)

(coauthors of a specification proposal), and David Winer of Living Videotext—all vendors whose memory-resident programs have experienced compatibility problems with foreground and other background programs.

The vendors are working with Microsoft Corp. of Bellevue, Wash., author of DOS and the chosen arbiter for devising specifications for memory-resident programs. The goal is to have all memory-resident programs recognize each other and follow a common method of memory allocation.

All of the major vendors have either sent a proposal to Microsoft or are working directly with Microsoft. To date, the verdict isn't in.

"We're not at the stage where we're prepared to talk publicly about this," says Adrian King, director of operating systems product marketing at Microsoft.

(For more on the proposed standard, see Peter Norton's column, "A Standard in the Making," page 79.)

No Culprits, Just Victims

The root of the problem lies in the design of the memory programs themselves and how current versions of DOS limit what they can do. These programs hide in RAM and are called up with a single keystroke or a combination of keystrokes. The growing list includes desktop organizers, thesauruses, keyboard macros, outline processors, and even joke programs.

By design, the memory-resident programs do not acknowledge DOS requirements. Since none of them recognize the correct memory allocation management schemes, their code cannot tell whether another program is being run or whether there is available memory for the pop-up program to appear.

As long as the programs have no way to acknowledge each other and to correctly allocate memory, they have trouble coexisting. They tend to interrupt whatever program is in memory and compete for control of the keyboard. It's common for more than one program to respond to the same combination of keystrokes and crash the whole system.

To complicate the situation, most of the memory-resident programs specify that they must be loaded into the computer last. Yet the way code is now written, each program can read only the most recently loaded software. If another software program is currently being used that is further down the "daisy chain" in the computer's memory, the program at the end of the chain can't recognize it.

"The burden is on the user to load the programs in the correct order and to find out what the correct order is," says John Socha, coauthor of the Socha/RoseSoft proposed specification. "One of the advantages of a specification is that when the [memory-resident] program loads itself, it can trace through the daisy chain and install itself in the correct order."

Waiting for Multitasking

DOS was originally designed as a single-user operating system for a single-user personal computer. The altematives are multitasking programs like *TopView*, *Microsoft Windows*, *GEM*, and *DESQview*, which are just beginning to catch on. They are sophisticated, graphics-oriented visual "shells" that create a multitasking/windowing environment and let you run a software program in each "window." Memory can be allocated among the windows at the discretion of the user.

The advantage of the win-

PC Magazine to Present 2nd Annual Awards for Technical Excellence

In the spirit of honoring the brains behind the technology, *PC Magazine* will present its 2nd Annual *PC Magazine* Awards for Technical Excellence at Spring COMDEX '86 in Atlanta.

PC Magazine is asking the computer industry for nominations for this year's awards. The goal is to recognize individuals who were responsible for the biggest technical breakthroughs in hardware and software in 1985.

Unsung Heroes '85

Last year, seven developers were honored at a gala event in Atlanta. They included Robert Carr for Ashton-Tate's *Framework*; Phillipe Kahn of Borland International for Turbo Pascal; Eugene Hill and Jim Slager for the Intel 80286 chip; Jeff Garbers of Microstuf for *Infoscope*; Robert Hamilton for The Software Group's *Enable*; and Henry Kee for the PC Blue Series.

PC Magazine's first round of awards (see "Profiles in Technical Excellence," *PC Magazine*, Volume 4 Number 16) represented a cross section of people who had contributed to setting a standard of quality and workmanship for the industry. The editorial board looked for the thought behind the product when making their decision: unit sales and dollar volume were not the criteria.

—The Editors

Photograph: Robert Phillips

Last year's awards honored the "unsung heroes" of the computer industry.

NEWS IN BRIEF

New York--Lotus Development Corp. of Cambridge, Mass., plana to ofter site licensea for buaineas users by year-end. Lotua's research into site licensing dates back to Auguat 1985 and covera such questions as pricing, copy protection, customer service, and cuatomer influence on future releaaea. Lotus aaya its software may be diatributed from a mainframe computer; at Exxon, the site of Lotua'a distribution experiment, users download parts of the program from the mainframe.

In a separate release, Lotus announced its support for the Microsoft Windows operating environment in future Lotus products. Microaoft and Lotua are developing drivers to adapt 1-2-3 to Windows.

The Interface Group of Needham, Mass., longtime sponaor of COMDEX, has purchased the Weat Coast and New England Computer Faires from Gulf & Western. The Interface Group hopea to take these end-uaer-oriented shows to major cities across the U.S. Interface Group president Sheldon Adelson believes vendors will be eager to sign up for these regional get-togethers. However, at least one

dowing programs is that they allow you to install an entire software program and switch between, for example, a word processor, a spreadsheet, and a database program.

Memory-resident programs will continue to battle with the PC's memory until one of three things happens: agreement on a standard, possibly in the form of documentation by Microsoft on how resident programs can access disk files; the release of a DOS version (perhaps DOS 4.0 or later) that contains multitasking capabilities; or the installation of a larger user base of multitasking/windowing programs.

A standard may instill more confidence in memory-resident programs and spur sales of RAM boards. But if windowing programs become more popular, they may displace the demand for memory-resident utilities by letting users access the utilities that the windowing program supplies or by just loading full-featured programs, such as spreadsheets, to perform a wide range of calculations. Memory-resident program vendors may then have to develop versions specifically for windowing environments.

For people who don't need to switch frequently between applications, memory-resident programs may provide window-like capabilities without the cost or memory overhead.

But what is the price of an interim solution?

"Products such as *SideKick*, *SuperKey*, and *Turbo Lightning* have to work with a lot of 'ill-behaved' standalone applications," claims Borland's Kahn. "A standard is viable only if users are ready to accept that some TSR [terminate and stay resident] programs will not work any more with some of their applications—for example, *XyWrite II Plus*."

Other vendors interested in the standard just want to see some action taken. "The change won't be overnight," says Bob Bierman, senior programmer at Living Videotext. "It will be passed around to get everyone's input. After it is agreed upon it will be incorporated into the next version of the programs." After a standard is imposed, Bierman does not expect it to eliminate competitive stances between vendors of memory-resident programs. "It won't be a limiting standard. It will focus compatibility where it should be—on the product rather than on the compatibility of the operating system." ■

■ CHRISTOPHER JOHNSTON

major player, Software Publishing, producer of the PFS aeriea, won't take part; it only goes to shows that attract dealers.

The West Coast Computer Faire runs from April 3 to 5 at San Francisco's Moacone Convention Center, overlapping Winter COMDEX, which takea place from April 1 to 3 in Anaheim, Cslif.

The beat atock market beta among up-and-coming computer companies? Try Compaq Computer, Ashton-Tste, and AST Resesrch, ssys Shearson Lehman Brothers in its "Commentary and Market Outlook on the Personal Computer Industry." The Americsn Express subsidiary slso predicts IBM will cut the price of its PCs by 15 to 20 percent this yesr.

Kamermsn Lsbs of Beaverton, Ore., is giving away PC-XT compatiblea with the purchaae of its Maaterflight hard diaka or tape backup systema. The free Kamerman Labs XT Kit 1 includes 128K bytea of RAM and a keyboard. Any catch? Only the price. Kamerman Labs' Masterflight 20/60 mass storage system runs $2,495.

Tandy 3000

(continued from page 33)

stalled the optional 20-megabyte hard disk (which, with the controller, brings the unit price to $3,599). Both drives are manufactured by Mitsubishi, with Western Digital controllers. Based on our experience, the 3000's fixed-disk installation and formatting, while reasonably straightforward, are probably best left to the technically oriented.

Tale of the Tape

Standard RAM supplied is 512K bytes, and there are sockets on the motherboard for an additional 128K ($129.95), which we installed with no more difficulty than temporarily dislodging a tenuously mounted hard disk activity lamp. There is space for an additional half-height disk drive, though even at this writing (the nominal introduction was at Fall COMDEX in November) Tandy was temporarily unable to supply a Tandy-la-beled 360K standard floppy.

Under its cover the Tandy 3000 houses a 170-watt power supply and supplies slots for ten standard plug-in boards. Two of these (one is less than full length) are PC-only compatible; the remaining eight carry the full IBM PC AT bus. The cooling fan is sufficiently noisy to make you appreciate the separation allowed by the long AT-style keyboard cord. The overall footprint is 19 inches wide by 18 inches; the machine's height is 6⅛ inches, and its weight is 35½ pounds. The case and chassis are heavy steel.

While the full battery of speed and compatibility tests on the Tandy 3000 must await our regular PC Labs test report, a quick first look was promising. *The Norton Utilities* system information test showed a PC-relative computing performance index of 6.4, compared with 5.9 for a standard AT, reflecting the higher clock speed of the 3000. PC Labs' prime number calculation required only 11 seconds (15 for the AT), and the Core International hard disk test pronounced the 3000's Winchester 30 percent faster.

Knockout Extras

The Tandy CM-1 color monitor ($599) and its video controller board ($499.95), which we attached to our 3000, provided crisp (600 by 400) resolution and CGA compatibility with the exception of IBM's "brown bit," which displays as a somewhat unsettling yellow-green when running COLORBAR .BAS.

The Tandy's keyboard, though PC AT-style in layout, lacks the positive feel of the IBM, specifically in precontact travel (too short) and force required (too little) for contact. Post-travel contact was fine, and with practice users should adapt. As if by way of compensation, the 3000 does have a large, red reset button recessed on the front panel—the switch that IBM forgot.

The technical reference manual is one of the best we've seen, and the general level of the user documentation was completely adequate.

If an AT alternative is in your future, the Tandy 3000 merits more than a first look. ■

PC MAGAZINE FACT FILE

Tandy 3000
Tandy Corp.
Marketing Information Dept.
1700 One Tandy Center
Fort Worth, TX 76102
List Price: $2,599 for 512K RAM, one 1.2-Mbyte floppy disk drive, one serial/parallel port, keyboard; with additional 20-Mbyte hard disk drive (as above), $3,599
Options: CM-1 color monitor, $599, and video controller, $499.95; or VM-1 monochrome monitor, $199.95, and controller, $249.95. MS-DOS 3.1, MS BASIC 3.1, and *Desk Mate*, $99.95; 128K RAM expansion kit, $129.95.
In Short: Faster and cheaper than the IBM PC AT, with excellent compatibility, unlike some earlier Tandy MS-DOS machines (Tandy 2000). The keyboard, while not bad, may not be to everyone's taste.

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PadLock is software. One of its programs formats any manufacturer's disk, embedding your secret code in sectors the operating system will ignore. Another program installs this code in any program files you name, whether YourProg or WordStar®, or any .COM or .EXE files. From then on there's no picking the lock without the combination: the coded software together with a coded disk.

So it's not despised copy prevention. Protected programs can be copied anywhere, to hard disks, to backup diskettes. It's a lock and key scheme. A protected program will just lock up at load time without a keyed diskette (possibly its own) in one of the drives. The key disk may then be removed to free the drive.

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Incidentally, don't look elsewhere. PadLock is available only from PC Brand.

Ask for	Prices
M0030 Formats 30 disks	$99
M0100 Formats 100 disks	$250

BRIEF

FOR ANY LANGUAGE

Is Anything But. A Whopper of an Editor

Dvorak in *Infoworld* said it for us: "the word is getting around...that Brief, The Programmer's Editor is simply the best text editor you can buy." With a name that belies its thoroughness, Brief™ has every feature you've ever contemplated for your editor-in-chief. Here goes.

Text, from keyboard or files, is housed in multiple buffers, and scrolled through one or more windows you open, close, resize. A text buffer may be called to different windows to view two areas at once. A change in one changes both. Text may be marked for printing, writing to files, movement to scrap buffers for cut and paste into other buffers, or deletion, with as many "undo" levels as you want.

To find and fix, Brief has text search abilities rivaling "grep", with wildcards for matching, indifference to intervening characters, acceptance of character ranges, even multiple choice of patterns and their replacements.

If you use Lattice, C86™, or Wizard, and have 320k, you can compile your C program without ever leaving Brief. It finds the lines with errors, and marches you through the text for repairs.

Parts of Brief were written with its own Lisp-like macro language. It has structure, 32-character variable names, conditional execution, loops, and you can actually read it! Nothing like the hieroglyphs we've seen elsewhere.

A macro compiler comes with your copy, and pre-written macros in source to give you the flavor. One even turns Brief into a word processor, with margin setting and wraparound. There's even a bulletin board and public domain disks with macros contributed by a mushrooming cult of macromaniacs. A disk full of contest-winning macros comes free with your purchase! (Needs 192k.)

Ask for U0590	PC Brand
List $195	$CALL

PROSPERO'S PRO PASCAL

BORLAND USERS SPECIAL OFFER!

ISO Validated Pascal for Serious Users

Turbo Pascal™ was irresistible at the price but its limitations loom larger as your Pascal expertise expands. Might it be time to look into a truly professional Pascal compiler?

Prospero Software's Pro Pascal™ was awarded a Class A certificate for its faithful implementation of the International Standard for Pascal (ISO 7185) conquering a suite of 740 tests, the only validated Pascal compiler for the PC and 8086 family of machines. Its UK creator has sold several thousand in a worldwide market where standards are a priority.

Turbo cannot compile programs utilizing standard Pascal features that Borland unaccountably sloughed off (e.g., get, put, page, function name passing). That's probably led to wordy equivalents in your programs at penalty of expanded size and run time. Bluntly, "there *is* a Pascal standard. [Borland] is definitely *not* standard Pascal" (Cortesi, *Dr. Dobb's Journal*, 7/85).

Pro Pascal corrects such deviance to make your work acceptable in any circles. Perhaps more enticing, it breaks free of Borland (and MT+™ and IBM®) 64k boundaries. Large memory model programs of 10,000+ lines and 1,000+ identifiers are now possible.

Pascal as defined is austere as an Alp, but Pro Pascal has sturdy outcroppings to hang onto: dynamic strings, random file record access, long integers, single and double precision floating point, an assembler level interface, and (again unlike Borland) separate compilation of program modules for later linking into large programs, so you can develop libraries of oft-used routines. Or disallow these extensions by the /s option whenever you require strict adherence to standard.

Prepare your source program using any text editor and Pro Pascal's three-pass compilation will convert it to Intel relocatable machine code for direct execution. Fast, tight code results which can use the 8087. The sieve runs faster than MS, MT+ or Borland, and produces a program *one third* the smallest of these.

Pro Pascal is a complete system. You get a librarian, a linker which scans libraries, accepts Assembler modules, and constructs overlays quite on its own (no contamination of source code), a cross-reference generator; a source and symbolic debugger offering multiple breakpoints and changable variables, and a runtime library which may be distributed with your work royalty free.

You certainly got your money's worth from Turbo, but Borland's bargain may now be getting very costly, so here's our deal.

Ask for	List	PC Brand
P0100 <	$390	$ 345
P010X < Borland Trade-In*		$ 299

*Upon receipt of original Borland disks

CURSES *Unix Style Screen Management*

Curses is a Lattice® creation which manages the screen of the IBM PC in the same fashion as the curses utility of Unix. This C library has all the same functions of Unix curses with matching parameter lists. So your Unix program will be content when you move it to the PC, and programs created on the PC will be Unix compatible.

Curses is a library of eighty-four functions and macros which can keep any number of screen images in memory. A screen may be full or partial size, and any can be summoned to the physical screen at your programs's command.

The product supports color, and all four memory models. In keeping with the terminal orientation of Unix curses, the physical screen is re-painted (at high speed) only when your program calls a refresh function. Within a screen, Curses employs a vast function set to get characters, wrap lines, scroll, blank lines, highlight—virtually any tool needed to update the screen.

Ask for	List	PC Brand
L0850	$125	$100
L0850 with Source	$250	$200

The TOOLSHED™ Trusted Favorites for a Well-Appointed Workbench

CVUE *Text Editor*

CVUE™ is Lattice's text editor which has undelete, full path name support, and features important to programmers: recognition of non-display characters, pattern searching, indenting and undenting.

Supports text files as big as RAM. Compact and fast. Runs in only 64k with no tedious overlays. The real value: Even the binary version offers full customization of keyboard commands. Plus, opt for source code and make this editor truly your own.

Ask for L2240, List $75, PC Brand $69
For Source Code as well, Ask for L2245, List $250, PC Brand $195

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PRO FORTRAN <

With Source Debugger

Prospero also offers a polished Fortran which satisfies completely ANSI X3.9-1966 (known as Fortran 66) and adds an abundance of Fortran 77 extensions (which may be blocked as a compile option). Its strict standards mean mainframe to micro compatibility.

Pro Fortran™ supports both small and large memory models, optionally uses the 8087, is equal to Microsoft in speed, but produces extraordinarily compact code—as little as 1/5 and an average of 1/2 the size of Microsoft's in tests we've seen! It comes with a linker, a librarian, and the same source debugger as Pascal above.

Ask for F0100, List $390, PC Brand $345

LMK *Unix-like "Make" Builds Systems Easily*

Working on a large program (in any language)? Tell Lattice's LMK™ what source files to compile using which options, which modules to assemble into what libraries, what libraries to search, what to link into the final product.

LMK keeps track of the last time every action was performed, and all the steps in your program system which depend on them. Over and over as you write and test, LMK rebuilds your program faultlessly, however intricate the assembly, and saves time doing only what's needed.

Ask for: L2100, List $195, PC Brand $159

CODE SIFTER *Profiler at Bargain Price*

Several expensive programs will now find the sluggish spots in your program, our Code Sifter saves you plenty. It divides .COM or .EXE files into partitions on its own (or you can specify boundaries), then samples your program at precise intervals, counting how many times it finds the instruction pointer in each partition. Between each run Code Sifter can discard less active ranges and re-partition the hot spots, so that you zoom in literally byte tight! You'll see unmistakably where to optimize.

Ask for N3100, List $119, PC Brand $99

TEXT TOOLBOX *Tames Text Files*

Unix boasts a number of muscular utilities that are migrating to the PC world. Lattice has assembled a cluster of the most useful text management tools into a single package. All now neutralize WordStar file idiosyncracies.

"Grep" looks for text patterns in any number of files. Want all occurrences of a global variable throughout a program system? Want to search all programs in a directory, down paths to other directories, or all files on a disk? Need to find all the function calls in an entire program system? Grep can do it with a powerful expression syntax that goes far beyond your text editor's search command.

"Splat" substitutes new text for matches found using grep's syntax. "Files" can copy or erase files down paths to the point of eliminating full directory structures.

"Diff" compares text files line for line. Its output is a precise list of instructions telling what to do to make two files the same, a list which can handed to "ed" to handle.

"Ed" is similar to the well-known Unix editor. It offers search and replace with grep syntax, block move, read-write, line numbering, append, insert, delete, etc. You can instruct "ed" to apply a file of commands to any number of target files, even complicated changes and text additions, such as output from "diff".

Ask for L2220, List $120, PC Brand $100

FIRSTIME *C Programmer for Hire. Real Cheap.*

Not interested in interpreters? Then explore the other fast lane to coding: language-specific editors. FirsTime™ is the strongest C editor we have seen, with many more commands and utilities.

FirsTime asks what program structure you want and sets up its skeleton for you "main", or "function", or "if-else" or "while" or any component of C, with all semi-colons and curly braces tended to.

It puts placeholders into these structures to prompt you to enter code—the conditionals and counters which complete an "if", for example. FirsTime can even transform one type of structure into another, such as "for" into "while" or "while" into "do". It checks that variables you enter have been declared, and highlights errors. Material can be pulled into ten buffers for movement elsewhere. Your last delete is held in one of them for "undoing".

Movement through the screen highlights the successive logical blocks of your program so that structure is always apparent, and can hide lower level statements to show the outer framing of programs. Makes a big contribution to error-free code.

Ask for E0460	PC Brand
List $295	$229

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C-TREE

B-Tree File Manager, Source Code, No Royalties!

C-tree™ has been around since 1979 (It became Digital Research's Access Manager™) That means seasoned, sturdy code which hasn't cracked under the weight of prolonged and widespread use.

C-tree comes in C source code, revealing all you've ever wanted to know about how b-trees are written Provided you bind it into your binary application, you can re-distribute C-tree without royalties

C-tree's design splits nodes to allow any number of users to access an index file simultaneously even during updates So multi-user configurations and adaptation to networks are possible. You must write record-locking routines, as they are compiler and operating system dependent, but the documentation shows how

The latest version has new features: support of variable record length files, multiple key indexes in a single physical file.

Thanks to source code which does not deviate from the K&R standard, C-tree can travel Tests in many environments prove that C-tree gives your application a ticket to anywhere.

C-tree permits any number of keys for a data file, supports duplicate keys, alphanumeric or numeric, etc , etc —it's a comprehensive product with everything you'd expect Intelligently designed, too, comprising both high level ISAM routines which minimize coding by handling all details of an activity, as well as decomposed step-by-step functions you can access directly Either way C-tree maintains optimal index structures which will find a record amongst a million ten-byte keys in no more than five disk seeks

Ask for F0660 < PC Brand
List $395 **$329**

ESSENTIAL C UTILITY LIBRARY NEW!

300 Functions, 50¢ Each

Nothing pays you back quicker than function libraries, for our money the treasure of the C language.

Essential's huge package has 49 functions for screen movement, character manipulation, color display, and screen save and restore, 49 graphics functions to draw lines, shapes and color fill, 18 to rework strings in novel ways; 27 to set and obtain the default drive and file date/time stamps, plus make, access and remove directories and files, 22 for time and date validation, formatting, and elapsed time computation, 10 to allocate and free memory and execute other programs from within the current program, 24 to capture and control keyboard input, 18 to drive printers, others for communications, sound, and, and

They are 95% in C, with those accessing DOS and BIOS (used by many of the C functions) in Assembler Everything is supplied as libraries and as documented source, so even for C savants, there's much to be learned rummaging about Demos show a sampling of what these procedures can be combined to do, and the manual clearly presents and describes all functions

Lattice U0300 / Mk Wms < U0301 / C86 U0302 / DeSmet U0303 List $185 PC Brand **$150**

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Even after using program disks, you may return any product in this space not coded "<" within 30 days for full refund of purchase price provided it is in our judgment in resalable condition

DAN BRICKLIN'S DEMO PROGRAM

Slide Show Your Latest Great Idea

OUTSTANDING

When the inventor of the electronic spreadsheet called with a new program, we sat straight up in our chair VisiCalc™ was for businessmen, but Dan's latest is for us programmers.

Ever had trouble putting a program idea into words? Programs are screens! Words don't work The answer Show your program as a procession of screens

Dan's new program makes it easy It creates slide shows that imitate a program's screens and sequential activity

Create a screen—a snapshot of your planned product as it runs Anything goes words, borders, box rules, inverse and underlining of monochrome, foreground and background color on the CGA and EGA Copy this "slide" forward with a keystroke, change it a little, to show the next instant of run-time Copy the slide forward again. Create a whole slide show of your program in action It will seem like the program itself is running

Each screen is in 80x25 character mode, not bit-mapped graphics All 250 characters and attributes are available from scrollable lists which pop to the screen All commands are layered in Lotus-style pop-up menus, with frequent choices mapped to the function keys as well.

Screen areas can be blocked for cut and paste or filled with color or characters, even made to blink Slides of off-appearing segments can be made for overlaying and any slide may have several overlays assigned to it

Slides can proceed at time intervals or in response to keystrokes, and depending on a user's response, you can tell the program to branch anywhere in the slide sequence to create innumerable paths through your show

Don't make your ideas struggle through coding to get to the screen Dan's Demo is invaluable to prototype the program you are about to write, to position all the labels, choose the color decor, smoothe out the keystroke interface *before* it gets etched in code It's blossomed throughout Lotus™, we hear "Lotus [was] my major test site", says Bricklin

Each purchase of Dan's Demo entitles you to redistribute fifty copies of the slide projector program along with your show Plain manual, no binder, to keep the price low because Dan thinks everyone should have one. You'll wish he'd penned Demo then and left VisiCalc for now (256k)

Ask for N0100 PC Brand
List $75 **$69**

C-DEBUGGER

Source Level Pesticide

Symbolic debuggers at least let you refer to the names you give to variables, functions, etc in your source programs—so you don't have to debug C programs by way of hex memory addresses By contrast, switch on the C-Debugger™ source display, though, from the top or any breakpoint, and enjoy the uncanny experience of watching your source code step by, one line at a time. Or skip ahead n lines and display from there. Or browse through source from the surrounding program area—even from another file.

Multiple breakpoints can be assigned to individual lines in your source files Areas of memory can be set read-only to let a form of write protection find the most elusive bugs, like pointer encroachment Trace options allow display of function names and lines numbers as executed Backtrace writes a history of all functions called, a roadmap of how you got lost.

Other commands display and alter memory and registers, show and replace expression values. Simple variables may be referenced directly by name (Not local names which the compiler doesn't map) C-debugger supports four memory models and several compilers (256k)

Ask for S1200 PC Brand
List $165 **$145**

PRE-C

Thorough "Lint"-like Analysis Now on the PC

Unix users have always had "lint" to thoroughly clean programs before they disappear into a compiler

Pre-C™ looms larger than "lint" It finds problems your compiler won't Problems that a debugger will have trouble figuring out Even problems which will cause trouble with other compilers

Pre-C finds all the syntactical tripwires that will blow out a compiler and much subtler problems code which will never be accessed, casts with suspect conversions, variables declared as external but never used, functions never called, machine-dependent expressions which inhibit portability, obsolete usage

But the big service of "lint" is this Compilers work with one module at a time. They know nothing of other modules which only meet up at link time Pre-C looks at *all segments of your program at once* and reports to you any inconsistencies of inter-module references

Pre-C uses the Unix System III compiler standard to guarantee maximum portability anywhere in the C world There are then plentiful command line options to relax such rigor during early coding when work is incomplete.

Use purchased binary libraries? Profile them for Pre-C and it will thereafter insure that function calls from any C program are letter perfect A miracle worker in speeding large system development Needs 128k minimum, 192k recommended

Ask for P0590 PC Brand
List $395 **$295**

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dBC Lattice Library Maintains dBASE Compatible Files With the Power and Speed of C

dBC links C to dBASE. It creates and maintains files and their indexes which exactly replicate dBASE™ file design So dBASE can read and update them And the reverse. dBC™ can use any files created by dBASE. Now C and dBASE can operate on the same data bases interchangably.

That opens up the widespread culture of dBASE installations to exploitation by C programmers, and there are a lot of dBASE users out there. You can tap that market, avoid the resident dBASE language, and gain all the advantages of C with this single product

dBC's functions parallel all dBASE's file handling commands, many decomposed to give closer control The manual discusses each backed by demo source files on disk

Use dBC for custom work for clients, or on its own It's a complete ISAM file manager for C whether or not dBASE will be used in tandem, supports all four memory models, and can have sixteen index and data files open Big discount to buyers of both dBASE II and III versions Specify Lattice, Microsoft 3.x, or DeSmet compiler

Versions	List	PC Brand
L00II for dBASE II	$250	$225
LCCII With Source	$500	$450
L0III for dBASE III	$250	$225
LCIII With Source	$500	$450

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SAVE $5 Just tell us this code P 6

dBASE III Plus: Power And Much More Speed

FIRST LOOK

BY GLENN HART

Ashton-Tate's *dBASE* family has long dominated the high-end database management arena. The original *dBASE II* (introduced in 1981) and the newer *dBASE III* (1984) are used by everyone from beginners to software houses developing commercial programs. With more than 100 competitors nipping at its heels, Ashton-Tate has now released *dBASE III Plus*. The competition is in for rough times again.

While *dBASE III Plus* is very much an evolutionary improvement over *dBASE III*, which it replaces, the gains in speed (see accompanying chart) are more revolutionary. A change in C compilers and new indexing algorithms make *dBASE III Plus* three to five times as quick at indexing and sorting.

Assisting Novice Users

dBASE III Plus has a greatly improved interactive Assist interface for beginners that is closely modeled on Ashton-Tate's integrated program, *Framework*. Its pull-down menus across a top-of-screen menu bar, status and message lines, and other aids are easy to learn and use. The display shows a Macintosh influence, but it doesn't support mice.

The Assist system is intuitive, yet allows access to many *dBASE III Plus* functions. Assist even allows you to use multiple-file, relational structures without pain. The only weak spot is Assist's flexible query system, which is complex and far from obvious to a less-experienced user.

The traditional *dBASE* dot prompt is retained but with added status and message lines. Many interactive commands now use the full-screen pull-down menu, pop-up window user interface.

A new Catalog system groups data, index, report definition, label, and query files to reduce clutter. It excludes all files except the ones included in the Catalog. The Catalog is actually a database itself that has specialized records for each of the component files.

dBASE III Plus introduces several new file types. "View" files set up relationships between data files and active fields and saves them for future use. Similarly, query files store filter definitions that exclude from consideration records not matching the defined criteria.

A powerful screen painter allows you to define screens by simply positioning fields and prompts on an empty "blackboard." You can specify range checking and input data manipulations and even add field definitions to a data file. The painter produces both a special screen file and program code, so that, like many third-party programs, it can be used as a code generator. *dBASE III Plus* now allows multiple input screens.

dBASE's previous report generators were so weak that many users had to learn programming to produce meaningful reports. The *Plus* version's report generator is much more capable, although the output is still not as flexible as that which you can produce with the programming language.

The advanced *dBASE* programmer is served with new functions and commands.

Ashton-Tate has expanded the language but did it so cleverly that recoding from existing *dBASE III* programs is unnecessary (unlike the move from *dBASE II* to *dBASE III*). In the new language, interactive debugging of program code is greatly improved with options to store a History of executed commands and a Suspend/Resume system to examine and change variables during program execution (it works much like a BASIC interpreter). A complete error-trapping system (again like that in BASIC) can make programs much more bulletproof. Assembly language modules can be loaded and called directly.

Network Compatibility

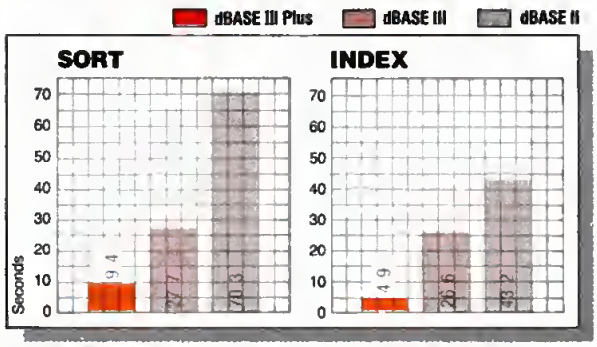
Serious business use of database management often requires multiuser access to shared data. Ashton-Tate has added support for IBM, 3Com, and Novell local-area networks to *dBASE III Plus*. Special *dBASE Administrator* software is supplied to control network use; a program called *Access* is needed for each participating network station.

Ashton-Tate chose to continue copy protection on the new version (using SuperLok). The program disk and its backup can each be installed once on a hard disk; it can be uninstalled if needed.

Ashton-Tate has said that it wants to increase sales to both the low-end and advanced-user market segments. *dBASE III Plus* does offer more to both ends of the spectrum, but it's still expensive and complex for the simple applications many less-sophisticated users construct. For the committed *dBASE* fanatic, though, *dBASE III Plus* is wonderful. ■

PC LABS BENCHMARK

Database Handling Speeds: dBASE III Plus vs. dBASE III and II



PC Magazine's database benchmark test measures the time, in seconds, that it takes a database management program to sort and index 500 randomly arranged database records of 113 characters each (in nine fields) on a hard disk. The *dBASE III Plus dBASE III dBASE II* comparison tests were run on an 8-MHz IBM PC AT, so speeds shown in the chart above are quicker than those found on previously published database benchmark tests where a standard PC-XT was used. However the relationship of relative sorting and indexing speeds among the three programs remains constant.

Ashton-Tate's new dBASE III Plus *performed three and five times faster, respectively, on standard PC Labs benchmark sort and index tests than the* dBASE III *program it replaces. The program also performed eight and nine times faster, respectively, than the venerable* dBASE II *program, which for years defined the ultimate in personal computer database programs.*

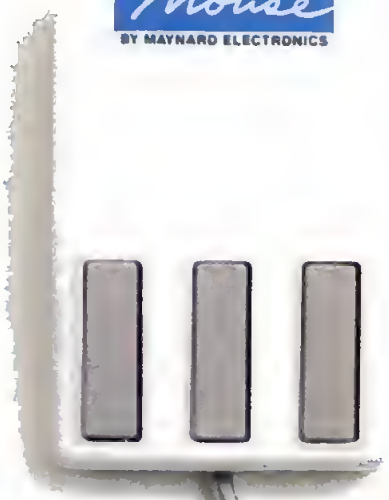
PC MAGAZINE FACT FILE

dBASE III Plus
Ashton-Tate
20101 Hamilton Ave.
Torrance, CA 90502-1319
(213) 329-8000
Requires: 256K RAM, two disk drives, DOS 2.0 or later.
List Price: $695; upgrade from *dBASE III*, $140 ($99 though March 31); no upgrade available from *dBASE II*
In Short: Powerful enhancements, substantially greater speed, and a new user interface make an already successful program better for both beginners and advanced users. Copy protected.

This Little Fella Means Business.

The Mouse by Maynard Electronics makes your favorite programs faster, easier, and smarter!

Mouse
BY MAYNARD ELECTRONICS



Teach The Mouse To Type.

A single Mouse click will instantly produce the character, sentence, paragraph, or anything else you've selected. **Click:** you call up the CustomKey menu. **Click:** your file is saved. **Click:** a commonly used paragraph appears in place. No other mouse gives you such power and versatility.

At last, an "intelligent" mouse! Now you can add command power to your programs, when you want, the way you want — instantly! The Mouse by Maynard Electronics comes with our CustomKey™ software which lets you assign and reassign commands **while using your favorite programs — even those without mouse utilities.** Fly through programs like Symphony,* Lotus 1-2-3,* Framework,* MultiMate,* and others with undreamed of speed! And of course, it's fully compatible with all programs written for a mouse, too.

A Tale Of Three Mice . . .

Compare our Mouse with the others running around and you'll see, there's no comparison! Here are just a few features across the board:

FEATURES	Maynard Mouse	Micro-soft	Mouse Systems
# of Button Combinations	7	3	5
Button Auto Repeat	Yes	No	No
Diagnostics	Yes	No	Yes
Dynamic Scaling	Yes	No	No
Cursor Overshoot Control	Yes	No	No
Adjustable Cursor Speed/Up, Dn (while running application)	Yes	No	No
Adjustable Cursor Speed/Rt, Lft (while running application)	Yes	No	No
Buttons-Definable (while running application)	Yes	No	No
Macros-Definable (while running application)	Yes	No	No
User-Definable Alternate Cursor Movement	Yes	No	No

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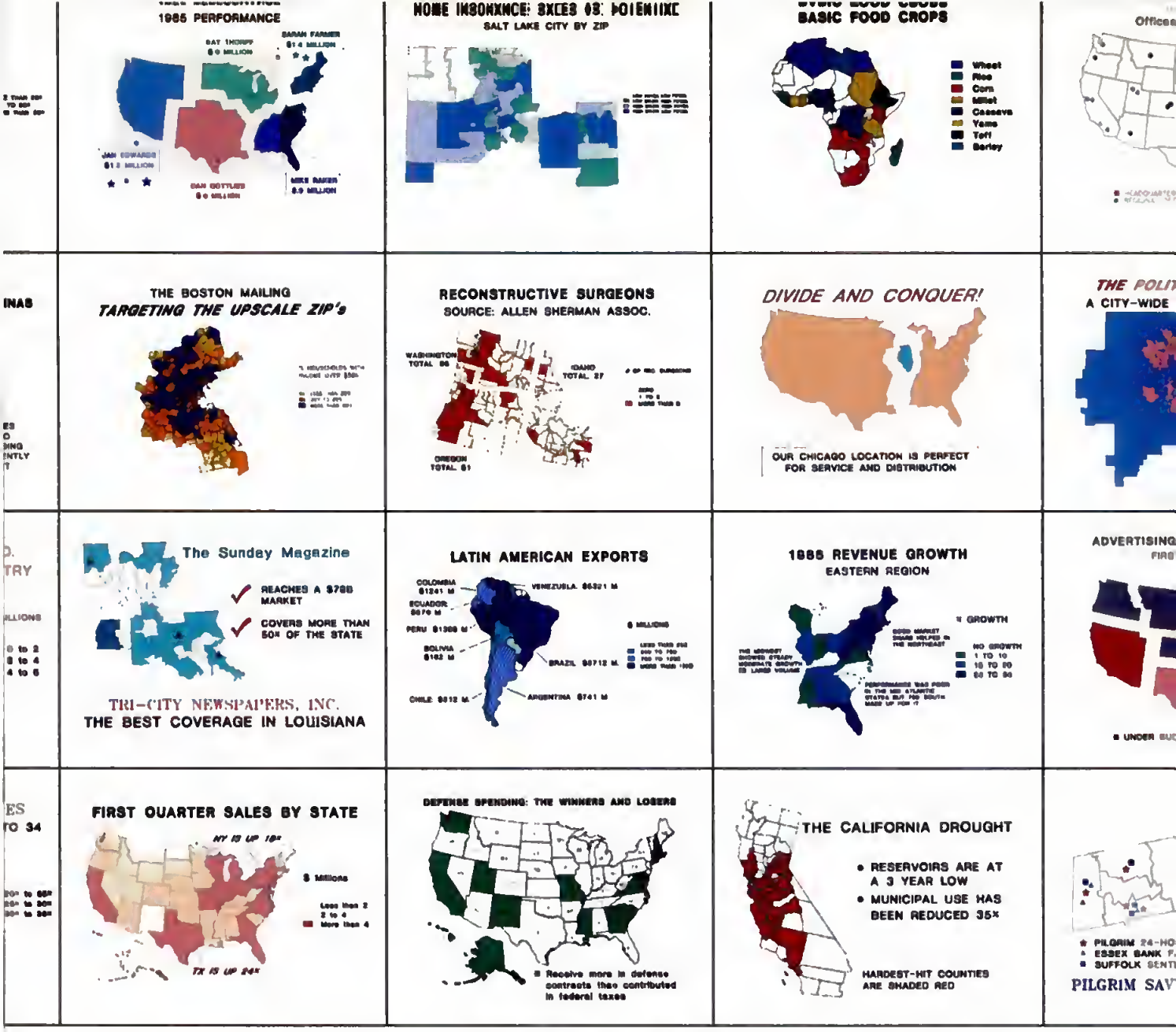

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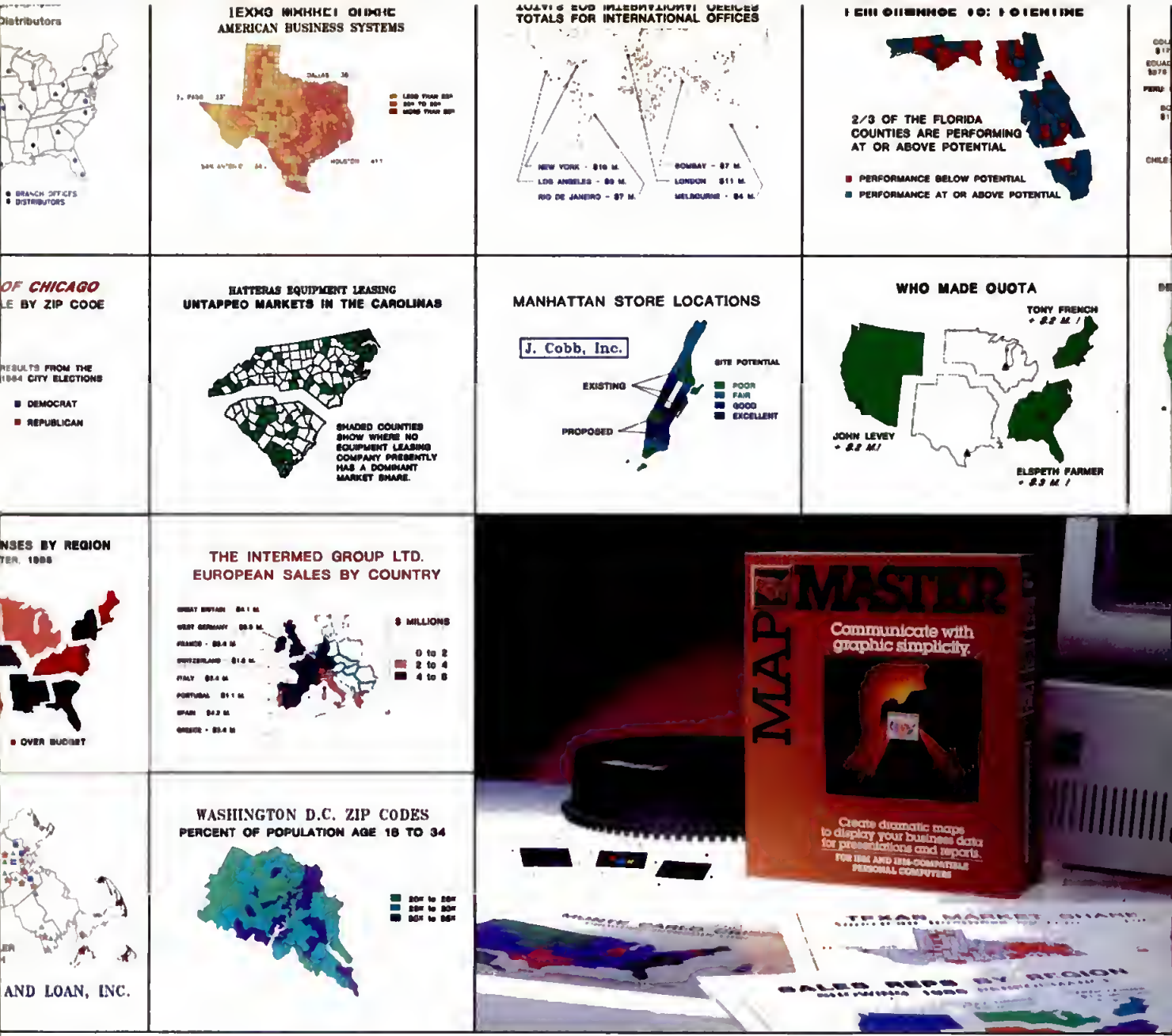

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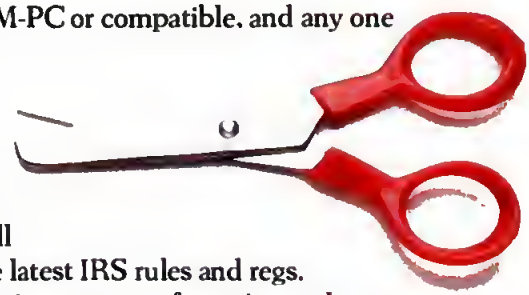

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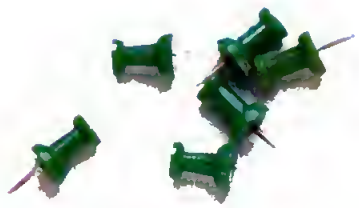

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CIRCLE 327 ON READER SERVICE CARD

New Xerox Printer/Copier Delivers Speed, Quality

Xerox's 4045 Laser CP Printer combines new clout in laser printers with long-standing expertise in photocopiers. The copier is a $400 time-of-sale option.

FIRST LOOK

BY JOHN DICKINSON

When two large men and a boy have difficulty dragging a huge box off a forklift, you can expect something out of the ordinary. And you'd be right because the box they were wrestling with contained Xerox's long-awaited 4045 Laser CP Printer. This 120-pound, 40-inch-long machine is bound to make serious inroads into the laser printer market, which is now dominated by Canon's ubiquitous printer engines.

Xerox's 10-page-per-minute, 300-dot-per-inch laser printer comes with Xerox 2700 (laser printer) and Diablo 630 (daisy wheel printer) command code compatibility, font cartridges, downloadable fonts, and full-page graphics. The printer can do printing jobs for up to four attached computers (using either a serial or parallel interface) or operate with a network that communicates in ASCII, IBM PC ASCII, ISO 6937 standard, or IBM's mainframe-based EBCDIC (standard or SNA) characters.

That's just your basic good news about this new challenger in the high-tech printer market that was announced the better part of a year ago but only delivered in January.

The great news is that the 4045 also functions as a desktop copier for small-volume (read "personal") copying jobs, thus answering a question users frequently ask: "If most of the parts for a photocopier are already in a laser printer, why not make it do both?"

Record Print Speed

The 4045 does both its printing and copying jobs credibly, if not perfectly. As a printer, the increase in speed over the by-now traditional Canon-engined laser printers is evident in the 4045's 191.8-characters-per-second effective speed (as measured by PC Magazine Labs standard printer speed test)—more than 75 percent faster than the Canon-powered Apple LaserWriter, which is rated at 8-ppm and tested out in PC Labs at 108 cps.

The Xerox 4045's font quality is unassailable, even when examined under a 30-power microscope. The only quality problem I detected was slight toner overloading in the machine's drum.

As a copier, the 4045's quality is as good as anything else around when it comes to pure black-and-white text but falls short of the quality produced by a typical desktop copier (such as a Canon PC series machine) when it comes to color and halftones. It is a one-copy-at-a-time machine, and it does not reduce or enlarge. But that doesn't detract from the convenience of having a copier at hand.

Xerox's 4045 is an intriguing machine from a company newly interested in the dynamic desktop computing market. Look for a more in-depth review (including graphics, font cartridges, and downloads) shortly in *PC Magazine*. Until then, no one's getting it off my desk—for more than one reason! ■

PC MAGAZINE FACT FILE

Xerox 4045 Laser CP Printer
Xerox Corp.
701 S. Aviation Blvd.
El Segundo, CA 90245
(213) 536-9187
List Price: $4,995; copier option, $400
Requires: Serial or parallel port.
In Short: A very capable, high-performance, 10-page-per-minute laser printer that includes a copier from Xerox.

Intel Above Board PS Sets a New Standard

FIRST LOOK

BY CHARLES PETZOLD

Suddenly that old stalwart of the expansion board world—the multifunction board with 384K bytes of RAM, parallel and serial ports, and a clock—is starting to look a bit flabby. Now that 256K-byte RAM chips are readily available and industry support is growing for expanded memory, several manufacturers are enhancing the traditional expansion board by adding hardware and software support for expanded memory.

The new Above Board PS from Intel (coauthor with Lotus and Microsoft of the Expanded Memory Specification) epitomizes this trend. The Above Board PS is like the Above Board PC except it has 512K bytes less of RAM (down to a mere 1.5 megabytes) and adds a parallel port, a serial port, and a clock with battery backup. A disk includes Version 2.3 of Intel's EMM.SYS Expanded Memory Manager driver, conventional and expanded memory RAMdisks and print spoolers, a CLOCK.SYS driver, an installation program, and a board checkout program.

If you already have 640K bytes of conventional memory in your machine, you can set up the board solely for expanded memory. Otherwise, you can backfill conventional memory to 640K and use what's left over for expanded memory.

The New Standard

For the serial port, Intel has adopted what it calls "the new standard": the AT-style 9-pin connector. Both the serial and parallel connectors now fit on the rear retaining bracket.

Intel has recognized the intelligence (and needs) of some of its customers and has added a "Hacker's Guide to Installing the Above Board." This 12- to 16-page pamphlet (depending on the Above Board model) is a masterpiece of conciseness and a welcome supplement to the larger manual.

For recent PC or XT owners looking for a first expansion board or for users with an older expansion board who can't seem to find a spare slot for expanded memory, a 1.5-megabyte multifunction board like Intel's Above Board PS makes perfect sense. ■

PC MAGAZINE FACT FILE

Intel Above Board PS
Intel Corp.
Mailstop TOC-03
5200 N.E. Elam Young Pkwy.
Hillsboro, OR 97124
(800) 538-3373
(503) 629-7354
List Price: 64K RAM, $445; 256K, $545; 1.5 Mbytes, $1,195.
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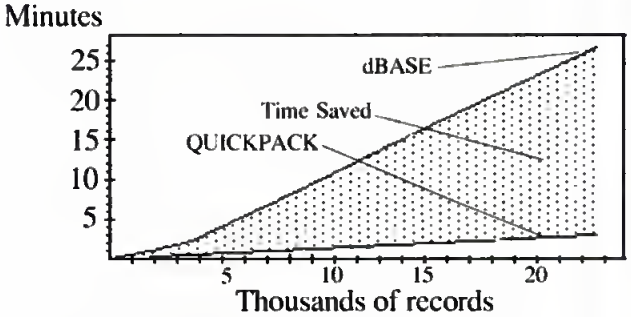

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PC Option Board	$ 95	$ 91
COMX		
130 Watt Power Supply	$179	$ 93
CORE Hard Disks for AT		
ATplus 20 meg for AT	$1595	$1395
ATplus 30 meg for AT	$1995	$1695
ATplus 56 meg for AT	$3595	$3195
EVEREX		
The Edge, Color/Mono Board	$399	$269
HAUPPAGE (HCW)		
8087 Chip	$175	$125
8087-2 Chip	$225	$173
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Mono Graphics Card	$499	$319
INTEL		
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Mind Prober	$ 50	$ 29
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Polywindows	$ 65	$ 43
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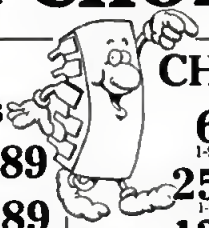

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■ PC UPDATE ■ VIRGINIA DUDEK

Quarterdeck Office Systems of Santa Monica, Calif., is shipping Version 1.2 of ***DESQview***, which now supports the **AST RAMpage!, Intel AboveBoard**, and compatible expanded-memory boards. The new version allows programs that have not been modified for expanded memory to run concurrently in expanded memory. When combined with the RAMpage! board, for example, *DESQview* can concurrently run up to nine programs that each require 620K bytes of RAM. Version 1.2 also has improved support for **Hercules** and **IBM Enhanced Graphics Adapters**, automatic installation of twice as many programs into *DESQview* as the original version, and special support for programs released since July 1985, including ***Framework 2***, ***Ready!***, ***Symphony 1.1***, and ***1-2-3***, Release 2. The new version is being bundled with AST's RAMpage! board. Also, a 3½-inch disk release of *DESQview*, Version 1.2, is available for the Data General/One and other PC-compatible laptops. Upgrades are $19.95 for registered users and free to extended support users.

* * * * *

Digital Communications Associates of Alpharetta, Ga., has enhanced its **IRMAkey/3270 PC/3270** terminal keyboard to support the PC AT. The keyboard uses a new software version, 2.27, that includes two separate keyboard drivers that address the PC and XT and the AT, so that the keyboard can automatically determine which computer it is attached to. A special "hot" key allows users to access the 3270 emulation mode in one keystroke. Three additional keys can be used for customized applications. The new version is still $329. DCA also announced that IRMA will now support the IBM PC through ***IRMAlink FT/3270***, software that allows IRMA to interface with IBM's *3270-PC File Transfer Program*, *PROFS/PCC*, and *PS/PC*.

* * * * *

Summit Software Technology of Norwood, Mass., has released Version 2.0 of **BetterBASIC**. It is now completely compatible with traditional BASICs such as GW-BASIC and the IBM PC's BASICA. Programmers can even load existing BASIC programs into BetterBASIC. Other additions include interactive editing and the ability to alter the variable type, the size of fixed strings, and so on. Version 2.0 retails for $199.

Ashton-Tate of Culver City, Calif., has discontinued the site-licensing plan for the *MultiMate* word processor as of February 1, 1986. The policy, which involved volume discounts and a one-time fee for permission to make duplicate disks and manuals, was discontinued so that Ashton-Tate could develop a single site-licensing policy to cover all its products. Ashton-Tate purchased Multimate International, based in East Hartford, Conn., in November 1985. Ten corporations had signed up for the plan. Ashton-Tate will honor any outstanding contracts until they expire.

* * * * *

Short Takes: Dialogic Corp. announced enhancements to its **Dialog/2 Voice I/O** voice communications system, which offers voice input/output, telephone management, and voice communications. A new version of the **VOICE.SYS** driver, Release 3.1, has been added, plus Version 2.0 of ***CallStatus***, a software program that makes it easier to develop such applications as outbound telemarketing and call transfer. Current users can receive a free upgrade by exchanging the old program and driver disks. Also, *CallStatus* 2.0 is being offered free with the purchase of each Dealog/2 System through March 31, 1986...Conceptual Software of Houston, Tex., has released Version 3.0 of ***PRODAS***, a database analysis system. Improvements were made to the database manager, statistical tools, and graphics features; they now permit you to import or export files from software like *1-2-3*, *dBASE III*, BASIC, and DIF files. General Linear Model, and other analysis of variance procedures and to produce bit-mapped plots, bar graphs, and pie charts. Updates are free to registered users...Spectrum HoloByte of Boulder, Colo., has upgraded ***The Executive Picture Show***, a business graphics program. Version 3.0 includes 15 additional types of *Picture Show* screen transitions plus simplified editing that lets you preview screen shows within the editor. Upgrades are free to those who bought the program directly from Spectrum. If you bought Version 2.0 from PC Software in San Diego, call the company for upgrades at (619) 571-0981. ■

* * * * *

PC Update reports on software and hardware enhancements. To contribute, write or call Virginia Dudek, PC Magazine, One Park Avenue, New York, NY 10016; (212) 503-5265.

ButtonWare Hits the Market with PC-File/R

FIRST LOOK

It's a program that meets most database needs.

BY BARBARA KRASNOFF

Like its predecessor, *PC-File III*, *PC-File/R* from ButtonWare Inc. in Bellevue, Wash., is a basic, get-the-job-done product without the ornamental frills of its more-expensive cousins. The latest version of the database program has commands that are transmitted from on-screen menus either by typing in abbreviated three-letter commands or by pressing the indicated function key.

You create a database by entering the define mode and typing in the names of the desired fields and their lengths. There are some special designations available, such as numeric data or an "automatic" field that will generate dates, times, and so on.

Once you have defined the database, you enter data on a record-by-record basis, with each record filling the screen. From the main menu, you can add to, edit, delete from, and "browse through" the database records. You then create a report form, decide which fields to use, sort and select criteria, and prepare to print. You can also write the database to disk.

Easy Mail-Merge

PC-File/R adds several more sophisticated features over *PC-File III*. They include a relational function that allows you to pull in data from other databases, pop-up help screens, enhanced smart-key capabilities, and telephone dialing. A simple word processing program is also included. Although unsuitable for large-scale word processing, it contains an easy-to-master mail-merge capability.

While *PC-File/R* is an effective database program, its strength on the open market is questionable. The program is capable of meeting most database needs, and at $149 it remains an inexpensive alternative to higher-priced programs. However, *PC-File/R* is also rigid and occasionally awkward, lacking many of the refinements needed to manipulate large amounts of data.

If you need extensive and flexible database capabilities and have little money to play with, you may want to try a copy of ButtonWare Inc.'s less expensive shareware program, *PC-File III*, first. Since the two programs are so similar, it's a handy way to find out if *PC-File/R* is really your cup of tea. ■

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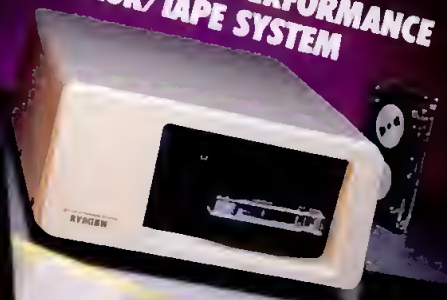

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HARD DISK	3 configurations for mass storage expansion	NA	NA	20 MB 40 MB 70 MB	NA	External $1195 External $1995 External $3995
CONTROLLER	XT compatible	NA	NA	NA	NA	Internal $ 350

*Cassette **Cartridge

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Iomega Doubles the Data Storage on Bernoulli Box

FIRST LOOK

BY JOHN DICKINSON

Iomega Corp.'s long-awaited 20+20 Bernoulli Box disk drive has finally arrived. The new product has the same form factor as the company's recently released half-height 10+10 and packs twice as much data.

The drive comes with a newly designed half-length adapter card that requires a different device driver and utility software. The new software includes optional menu interfaces to make it easier for novice users to format and copy disks.

Iomega's new card can also be equipped with optional ROM chips that enable the disk drive attached to it to be used as a boot disk. This feature finally overcomes one of the very few objections users have.

Each of the two cartridges can hold 20.38 megabytes for use on-line or as backup for hard disks or other Bernoulli Box cartridges. According to Iomega, the new backup/restore software supplied with the driver card can be used to back up an AT's 20-megabyte hard disk onto one 20-megabyte cartridge. The disk can be formatted for DOS 2.0/2.1 or take advantage of DOS 3.0/3.1's ability to use larger file allocation table entries. The capacity is the same for each format, but the newer DOS allows smaller sector sizes to be used for large disks, thus increasing the number of files that can be stored.

Equal Performance

Performance of the new 20+20 disk is identical to the 10+10 and, for that matter, to the original Bernoulli Box. Tests run on a PC-XT resulted in read and write times about two and a half times as fast as the XT's internal hard disk drive. Apparently, Iomega engineers felt that the Bernoulli Box's original performance was good enough for performance junkies and didn't seek improvements in that area.

The new disk is still single-sided but uses a higher-density media than the older cartridges. The original-format 10-megabyte disks can be read from but not written to the new drive. You can move two full 10-megabyte cartridges onto one 20-megabyte cartridge, but there is no going back once you've made the upgrade.

The 20+20 costs $4,695, making it $1,000 more than the 10+10. Unless you're genuinely committed to the 10-megabyte format, the new drive is worth the extra bucks. ■

PC MAGAZINE FACT FILE

20+20 Bernoulli Box
Iomega Corp.
1821 W. 4000 South
Roy, UT 84067
(801) 778-1000
List Price: $4,695
Requires: IBM PC, XT, AT, or compatible.
In Short: Iomega's 20+20 Bernoulli Box gives you 40 removable megabytes within a modest size footprint. Its price is very reasonable given its potential for unlimited on-line storage and reliable backup.

■ COMMUNIQUÉS ■ EDITED BY BILL HOWARD

Why IBM Seems Dull by Comparison

Jean-Louis Gassée, Apple's new vice president in charge of the Macintosh, never hit it off with Apple cofounder Steve Jobs. How bad was it? Jobs irked Gassée's sense of fairness by regularly parking in a spot reserved for the handicapped, according to *Newsweek*. Gassée reportedly asked Jobs one day: Was the space for the emotionally handicapped, too? ■

Bringing Magic Fingers out of the Motel Room and Into the Office

Computerise (47-09 30th St., Long Island City, NY 11101; (718) 786-9100) introduced a $49.95 vibrating Footrise footrest for PC users. For the less adventurous, there's a $29.95 adjustable model with a "chrome frame and sturdy board that compliment [sic] any office decor."

Computerise Footrise. With this on the floor, who needs etchings on the wall?

Indeed, visitors have taken to ignoring the Picasso lithograph on the wall once they see the chic Footrise footrest. ■

Pleaze Disregard Are Preevious Leter

Delacorte & Bacon, a public relations firm in San Francisco, issued a red-faced correction to a recent press release for *Reference Set* which is manufactured by its client Reference Software. The reason for the correction was that the original press release contained four typographical errors.

Reference Set is a spelling checker and thesaurus. ■

Dirt-Poor Farm Girl Starts Own Computer Firm — Then Sells It for $40 Million

RAGS TO RICHES

HOME SWEET HOME

Nothing New on the Elvis Front, No UFO Sightings, and We've Got Pages to Fill

With computer magazines going belly up left and right and the survivors stressing productivity over personalities, who's to pick up the slack? Why, the *National Enquirer*, of all publications.

The *Enquirer* recently profiled industry analyst Portia Isaacson of Future Computing in a piece ripe with the usual "rags to riches" anecdotes.

Portia's secret of success? "Always be on the lookout for opportunity," she confided.

And don't park in spaces reserved for the handicapped when you're Missus Big. ■

Affordable 24-Pin Quality With NEC, Epson Printers

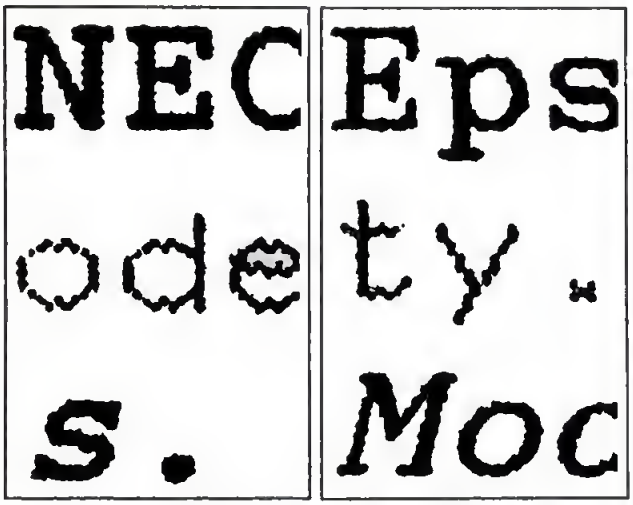
FIRST LOOK

BY CHARLES PETZOLD

The print quality of conventional 9-pin dot matrix printers has gotten about as good as it's going to get. But if the 9-pin Epson FX-85 and IBM Proprinter are still not good enough for you, if you want close-to-daisy-wheel-quality with the speed and flexibility of dot matrix, and if you need to stay below $1,000, you now have other options.

Epson and NEC have introduced 24-pin dot matrix printers in standard and wide-carriage versions. The 24-pin dot matrix technology, formerly the province of machines in the $1,500 range (Toshiba P351 and Epson LQ-1500), is now available for just a few hundred dollars more than the cost of a good 9-pin printer.

These new printers are similar in many ways: They all use 0.2-millimeter diameter pins arranged in two staggered rows of 12 pins each. In the attractive letter-quality mode, the Epsons and NECs print about 50 characters per second using the PC Magazine Labs standard printer speed test. A faster draft-quality mode (still readable but obviously dot matrix) doubles the speed to 100 cps.



Enlargements (at 5×) of the NEC P6, left, and the Epson LQ-800 print samples in letter quality and draft modes show more similarities than differences. Both print about 50 characters per second in letter quality mode and 100 cps in draft.

Epson Compatibility

The control sequence command set in the new Epson and NEC printers is a superset of that used in the $1,395 24-pin Epson LQ-1500. Hence, it is upwardly compatible with other Epson printers and the IBM Graphics Printer. The NEC P6 and P7 add a few control sequences to the LQ-1500 set, including striking triple-width and double-height print modes.

Despite the number of pins, these new Epson and NEC printers maintain compatibility with the 8-bit graphics modes of the Epson FX and MX printers and the IBM Graphics Printer. With the DOS GRAPHICS program loaded, you can still dump graphics screens. A medium-resolution screen dump tried out on the Epson and NEC 24-pin printers was significantly denser and more attractive from the Epson than from the NEC.

Both the printers include additional 24-pin graphics modes that allow resolution up to 180 dots per inch vertically and horizontally. The Epson LQ-800 and LQ-1000 add a graphics mode with 360 dots per inch horizontally but with consecutive dots prohibited. The NEC P6 and P7 printers also include a 360-dpi horizontal graphics mode (with a different control sequence), but the manual does not mention consecutive dot prohibition.

The NEC printers also add a non-Epson control sequence for 1/360-inch line spacing (the Epson is limited to 1/180 of an inch), so NEC claims a 360- by 360-dpi graphics resolution. (Laser printers usually have a 300- by 300-dpi graphics resolution, but the dots are much smaller and more precisely printed.)

The new Epson and NEC printers also include compatible font-download facilities limited to characters with ASCII codes between 32 and 127. You can download an alternate font for either the letter quality, draft, or proportional print modes, but for only one mode at a time.

As shipped, the LQ-800 and LQ-1000 retain Epson's italic character set. The NEC P6 and P7 printers can be set to either the IBM character set or Epson italics by a DIP switch or through a control sequence. The Epsons require an IBM Personality Cartridge ($79.95) for the IBM character set. Once a personality cartridge is installed, you can also purchase additional font cartridges at $49.95. The NECs do not have a provision for font cartridges. The Epson printers include both parallel and serial ports; NEC has different serial port models if you need a serial interface.

Extra Cost Tractor Feed

The Epson and NEC printers come standard with only a single-sheet friction feed. Tractor feeds and cut-sheet feeders are available separately.

Both Epson and NEC have done a good job on the manuals. However, in their descriptions of control sequences and programming, the NEC manuals have more information than the Epson manuals.

The similarity of the new Epson and NEC 24-pin printers, despite their strengths and weaknesses, makes it difficult to choose either as superior. More important than that, though, Epson and NEC have defined a new price range and market for 24-pin machines. ■

PC MAGAZINE FACT FILE

LQ-800 (normal carriage)
LQ-1000 (wide carriage)
Epson America Inc.
2780 Lomita Blvd.
Torrance, CA 90505
(213) 539-9140
List Price: LQ-800, $799; tractor, $49.95; cut-sheet feeder, $129.95. LQ-1000, $995; tractor, $49.95; cut-sheet feeder, $169.95
Size: LQ-800: 3.8″ × 16.5″ × 13.2″; 13.2 lb. LQ-1000: 3.8″ × 23.5″ × 13.2″; 17.6 lb.
In Short: 24-pin dot matrix printers that combine attractive print quality, Epson-compatible control sequences, and graphics with low-cost paper-handling options.

Pinwriter P6 (normal carriage)
Pinwriter P7 (wide carriage)
NEC Information Systems Inc.
1414 Massachusetts Ave.
Boxborough, MA 01719
(800) 343-4418
(617) 264-8000
List Price: P6, $699; unidirectional tractor, $55; bidirectional tractor, $159; sheet feeder, $330; P7, $899; unidirectional tractor, $80; bidirectional tractor, $170; sheet feeder, $420.
Size: P6: 4.0″ × 16.1″ × 13.1″; 17.6 pounds. P7: 4.9″ × 22.4″ × 13.1″; 24.3 lb.
In Short: 24-pin printers that are generally compatible with the Epson 24-pin dot matrix printers and add the IBM high-character set as well as some additional control sequences.

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CIRCLE 515 ON READER SERVICE CARD

■ NEW ON THE MARKET ■ EDITED BY DAVID OBREGON

286 Express Accelerator Card

Users of the IBM PC or PC-XT seeking speedier systems might take a look at the 286 Express Accelerator Card from PC Technologies Inc., a half-length board containing an 80286 microprocessor running at 8 MHz. According to the manufacturer, the board can boost a PC or PC-XT system's operations by as much as 600 percent in some applications, making it more than 30 percent faster than a standard IBM PC AT.

The 286 Express Accelerator Card is compatible with DOS software and includes an 8K-byte cache memory that provides zero-wait-state access to the most recently used code and data. The board conforms to the Lotus/Intel/Microsoft expanded memory specification and operates with local area network and mainframe communications products. It is also compatible with IBM's 3270 PC Model GX.

List Price: $795. **PC Technologies Inc.**, 704 Airpon Blvd., Ann Arbor, MI 48104; (800) 821-3086, (313) 996-9690.

CIRCLE **607** ON READER SERVICE CARD

Slot 10/20/21 TurboDrive

Data Zone Inc.'s new self-contained 3½-inch, 10- to 44-megabyte hard disks are available in standalone compact cases or as plug-in boards. Designed to withstand accidental shocks of up to 60 Gs (making it ideal for use with transportable PCs), either version of the Slot 10/20/21 TurboDrive can be used in applications where data security is a concern. Users can unplug the drive for storage in a vault or other secure location, or carry it from computer to computer.

The manufacturer includes an Intel 8088-2 microprocessor and crystal that allows the user to upgrade a PC from 4.77-MHz to 8-MHz operations.

The Slot 10/20/21 TurboDrive is available in storage capacities ranging from 10 to 44 megabytes and uses the PC's existing power supply. It can boot directly as drive C: without requiring changes in a system's DIP switch settings. The external version of the unit also includes an optional slot extender.

Slot 10/20/21 TurboDrive, Data Zone Inc.

List Price: 10 Mbytes–44 Mbytes, $899–$1,999 (external case, $100). **Data Zone Inc.**, 7136 Owensmouth Ave., Canoga Park, CA 91303; (800) 341-7355, (818) 704-4955.

CIRCLE **606** ON READER SERVICE CARD

Power Centers

Dynatech Computer Power Inc. has introduced two 600-watt power control, surge suppression, and communications protection devices. Both the Power Center/100 and Power Center/400 units fit between a monitor and systems unit and can accommodate up to five AC components. The Power Center/400 unit also protects a modem's phone line. Connected devices can be activated by front panel controls or in a programmed sequence via a calculator-style keypad. Both models incorporate three-stage transient-surge suppressing circuitry that reacts within 5 billionths of a second to line disturbances.

The 400's modem jack continuously monitors and protects the telephone line, absorbing potentially harmful surges that could damage a modem and disrupt communications. This model also features a remote activation system with password security, permitting the connected modem to turn on computer equipment from a correctly entered remote signal, record the time of the call and all activity, then shut the equipment down.

List Price: Power Center/100, $189; Power Center/400, $489. **Dynatech Computer Power Inc.**, 4744 Scotts Valley Dr., Scotts Valley, CA 95066; (800) 638-9098, (408) 438-5760.

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HELP!

HELP!, a series of RAM-resident libraries, offers ready descriptions of proper usage of all major commands or key words in

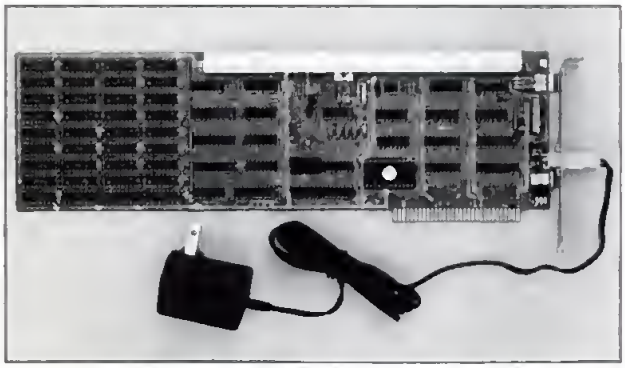
HOT PROSPECTS

Nonvolatile RAMdisks from Tecmar, Kapak

Tecmar Inc.'s new MegaFunction board combines a 1.25-megabyte nonvolatile RAMdisk with independent power supply and a parallel printer port, a serial port, and a clock/calendar. The MegaFunction RAMdisk, unlike conventional RAMdisks, has a continuous power supply from its own line adapter, keeping its data active even when the user's system is off. It can serve to boot up a system, and stored data will survive a warm reboot.

When installed in systems with less than 640K bytes of RAM, the board will fill out the system memory to the PC's 640K-byte limit, assigning all memory above that point to a RAMdisk. The board is not designed for use with either the AT extended memory or the Lotus/Intel/Microsoft expanded memory standard.

A switch allows the board to emulate the AST SixPackPlus's clock/calendar, permitting the user to run clock setting and accessing software designed for either product's clock.



The Novo Drive 1000, from Kapak Design, insures data loss protection for up to 1 megabyte of RAMdisk memory with its independent power supply.

List Price: $895. **Tecmar Inc.**, 6225 Cochran Rd., Cleveland, OH 44139; (216) 349-0600.

CIRCLE **609** ON READER SERVICE CARD

Novo Drive 1000

The Novo Drive 1000 card offers the user a 1-megabyte nonvolatile RAMdisk that operates at twice the conventional RAMdisk speeds without occupying main memory space. Firmware ROM included on the Novo Drive 1000 card controls all operations, including rapid system boot-up, and causes the board to appear to the user's system as a conventional disk. The board has its own power supply and a 2-hour onboard backup battery to prevent data loss from power failures.

List Price: $395. **Kapak Design**, 18784 Cox Ave., Saratoga, CA 95070; (408) 378-4444.

CIRCLE **608** ON READER SERVICE CARD

DOS, BASIC, and C; additional languages are planned for future release. It can read a word typed on-screen by the user or marked by cursor, producing a window of help information regarding correct syntax and usage.

List Price: With one language library, $49.95; additional language libraries, $19.95 each. **MicroSmith Computer Technology,** P.O. Box 1493, Elkhart, IN 46515; (800) 622-4070, (800) 942-7317 in Ill.

CIRCLE **604** ON READER SERVICE CARD

Electrohome ECM 1901

Electrohome Ltd. targets large CAD/CAM display applications for its 19-inch high-resolution color display. The ECM 1901 accepts a variety of inputs at different scan rates and can display images at resolutions of up to 1,100 by 800 pixels at 25 kHz when used with an appropriate high-end graphics card. A larger version of the ECM 1301 RGB display, it incorporates a long-persistence phosphor, a 0.31-millimeter dot pitch, and user-adjustable horizontal scan rates ranging from 15 to 25.5 kHz.

The Electrohome ECM 1901, from Electrohome Ltd., is a multiuse, graphics color display.

A plug-in module system accepts a choice of RGB RS-170 to RGB TTLI signals; the modules are interchangeable, permitting the monitor to be used in more than one type of graphics workstation. While the basic IBM-compatible module can be used with the IBM CGA, EGA, or PGA adapters, it is best suited for use with boards from Number Nine Corp., Control Systems, and others. The analog RGB RS-170 module features BNC connectors, loop-through capabilities, and 75-ohm termination switches.

List Price: $2,160. **Electrohome Ltd.,** 809 Wellington St. North, Kitchener, Ontario, N2G 4J6 Canada; (519) 744-7111.

CIRCLE **603** ON READER SERVICE CARD

Artist 1 Plus

Control Systems Inc.'s new Artist 1 Plus high-resolution graphics board produces flicker-free images at a noninterlaced resolution of 1024 by 768 pixels. Alternatively, it can be configured by the manufacturer to display a 1024- by 1024-pixel interlaced image. Either version is intended for use in graphics applications needing greater resolution and functionality than that provided by IBM's Professional Graphics Adapter.

The Artist 1 Plus can produce images in up to 16 colors (from a palette of 4,096) stored on four simultaneously accessed memory planes. A high-resolution monitor with a 64 MHz bandwidth is required to display the noninterlaced 1024 by 768 pixel image. For interlaced 1024 by 1024 pixel resolution, a 35- to 50-MHz monitor with long-persistence phosphor is recommended. Monitors meeting these requirements are also available from the manufacturer and other producers of high-end graphics displays.

List Price: $2,795. **Control Systems Inc.,** 2855 Anthony Ln., Minneapolis, MN 55418; (612) 789-2421.

CIRCLE **614** ON READER SERVICE CARD

PostmatiQ

MCTel Inc.'s standalone communications unit automates a range of telecomunications functions previously the province of software. The PostmatiQ device is built around Motorola's 16-bit 68000 microprocessor and incorporates 128K bytes of RAM, three serial ports, one input and one output parallel port, a Hayes-compatible 300/1,200-bps modem, and a clock/calendar. Up to 128K bytes of ROM containing PostmatiQ's operating environment, programming language, and optional custom applications are provided.

PostmatiQ's programming language includes more than 75 commands that can be used to automate routine data communications without accessing the processing, memory, or communications resources of an attached PC. The unit can also serve as a communications server in local area networks; as a replacement for dedicated Telex or TWX devices (and their requisite leased phone lines); or as an interoffice messaging and data exchange system, with file encryption and password protection provided in ROM.

List Price: Under $1,000 for single units. **MCTel Inc.,** 3 Bala Plaza East, #505, Bala Cynwyd, PA 19004; (215) 668-0983.

CIRCLE **613** ON READER SERVICE CARD

EZStat

Originally developed in-house by a major corporation to meet its own analytical needs, *EZStat* is a menu-driven statistical analysis package with linear, polynomial, and exponential regression, means testing, and correlation analysis functions. Basic statistics of a single variable and data editing and data transformation capabilities are also included.

EZStat can read and write ASCII and DIF files. In multiple linear regressions, the program provides a forward-stepwise regression that can automatically choose the best fit of a set of data to several test variables. The Durbin-Watson test for autocorrection is given as a by-product of the regressions.

Also included with *EZStat* are two templates for *1-2-3* that perform basic statistical analyses and linear regression using *1-2-3*'s built-in functions.

List Price: $99.95. **Requires:** 384K RAM, two disk drives, DOS. **FutureWare,** 2223 Dodge St., Omaha, NE 68102; (402) 633-6300.

CIRCLE **612** ON READER SERVICE CARD

OCTASYNC

IBM PC AT users running multiuser operating systems under UNIX or a UNIX-like environment can link up to eight terminals to their ATs, forming a low-cost local area network, with this single-slot expansion board from SMT Inc. The OCTASYNC board provides eight asynchronous serial ports and one parallel printer port. Each serial port is interrupt-driven. There is a minimum of two selectable interrupts per port.

List Price: $672. **Requires:** Multiuser UNIX-based operating system. **SMT Inc.,** 1145 Linda Vista Dr., San Marcos, CA 92069; (619) 744-3590.

CIRCLE **611** ON READER SERVICE CARD

PC/HIBOL

Delphi Data Systems Inc.'s PC/HIBOL allows the IBM PC to be used to develop, test, and run COBOL applications written for IBM CICS/VS mainframe computers. PC/HIBOL generates COBOL code and BMS maps for both the CICS/VS and the IBM PC from the same program specifications. ■

List Price: $995. **Delphi Data Systems Inc.,** 9615 Girard Ave., South, Minneapolis, MN 55431; (800) 328-4827.

CIRCLE **610** ON READER SERVICE CARD

The PostmatiQ, from MCTel Inc., is a 16-bit programmable telecommunications unit

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Because today is the day we introduce our new Pinwriter™ P5XL dot matrix printer. The only dot matrix printer available capable of producing the crisp, black printing you associate with a letter-quality printer. Because it's the only one designed to use not just a fabric ribbon, but a letter-quality multistrike film ribbon—the same ribbon used in typewriters and letter-quality printers.

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CIRCLE 346 ON READER SERVICE CARD

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CIRCLE 179 ON READER SERVICE CARD

■ FROM THE EDITOR'S SCREEN ■ BILL MACHRONE

THIS MUST BE PROGRESS

Three cheers! Copy protection is finally dying out, with Microsoft taking the lead in its extinction. The user's interest is finally triumphing over the manufacturer's.

Copy protection is going away. It has to. Like the dodo, it's too clumsy and stupid to survive in the rapidly changing PC environment. Fortunately, no Sierra Clubs or Greenpeaces are lobbying for its preservation. I hope that the people currently plying the copy-protection trade find gainful employment before they join the ranks of buggy-whip makers.

GOOD CITIZEN MICROSOFT

Last December, I complained about the apparent schizophrenia at Microsoft: Virtually all the consumer products were copy protected, while none of the systems and program development products were.

Since then, Microsoft has seen the light. The new version of *Microsoft Chart* is not copy protected (the original version was the only copy-protected program I allowed on my hard disk). Likewise, the company removed the protection from *Access*, its otherwise-stellar communications product. It had to, of course, after its debacle with the false "trashing program disk" error message the program put up when it thought an attempt had been made to illegally copy it. Consumers have adopted a once-burned, twice-shy attitude toward any product with a reputation for copy protection hassles. Rumor has it that the next version of *Microsoft Word* will also abandon copy protection. The last holdout is *Project*, but it's unlikely to stand alone as Microsoft's only copy-protected product.

There are lessons to be learned from Microsoft's actions: The first and most important is that big companies can see the error of their ways and respond intelligently. The second is that customer goodwill is worth more to such companies than the extra bucks they would make by forcing the issue through copy protection.

More and more, companies who copy-protect their software have egg on their faces as their policies come under closer scrutiny. Horror stories abound of legitimate users losing their key disks or hard disk–installed programs to the vagaries of everyday computing. The hell that users must go through just to get up and running again is inexcusable.

Site licensing is one way out of this predicament for those software publishers who steadfastly maintain their outdated copy-protection policies. Valued corporate customers can cut a deal to pay a flat fee to the publisher. In return, they can make copies for internal use. Sometimes there is a cap on the number they can make, other times not. Sometimes they purchase the documentation; they can also opt to reproduce it themselves. There are variations on the theme, but the general idea sounds pretty good, doesn't it?

Illustration: Tom Sciacca

Anything's an improvement, but site licensing doesn't address your individual needs. Let's say your company site-licenses a copy-protected product, *WonderCalc*, with the right to make unlimited copies. You become very proficient, a power user. *WonderCalc* is everywhere you turn in the office. You realize that *WonderCalc* would be ideal for a home application. As a solid citizen, you resist the temptation to lift a copy for your personal use off-site. Besides, you want the manufacturer's bound documentation and full warranty/upgrade protection. You don't even bat an eye as you plunk down $495 for the product. You install it on your home system's hard disk.

Then your hard disk goes flooey. You reformat. All looks well, so you reinstall *WonderCalc*. The hard disk dies again, and so you replace it.

Now the fun starts. You've "used" your allowable installations from the *WonderCalc* system disk, and now it won't even boot anymore. After beating your head against "customer service," you're about ready to give up on *WonderCalc*. But then, there are all those unprotected copies beckoning at the office....

If this were an isolated case, it wouldn't be worth chronicling. But it happens every day, to every kind of user. It's getting worse, not better: The proliferation of hard disk kits, compatibles, and AT clones makes it all the harder for the software manufacturer to come up with software

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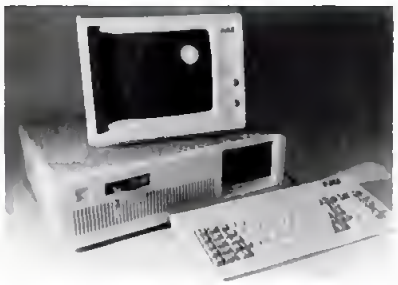
XT-PLUS IBM XT COMPATIBLE $399.①

AT *jr* 8MHz COMPATIBLE AT SPEED $699.①



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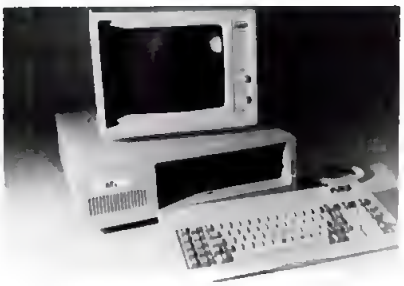

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CIRCLE 507 ON READER SERVICE CARD

■ FROM THE EDITOR'S SCREEN

that will run on everything. Copy protection makes the job several times harder.

A new breed of users is electing not to spend thousands more on IBM hardware just so they can be guaranteed that the copy-protection schemes will work. This trend is accelerating. One software developer I know has two PC ATs and two Taiwanese compatibles. The ATs have had every imaginable problem, from "Disk Boot Failure" to core meltdown. You can guess where he'll spend his next hardware dollars, unmindful of the few programs that won't run on the non-IBM machines because of copy-protection schemes.

In fact, the hardware manufacturers have always been allied against copy protection, although they've never come out and said so. Basically, they don't like anything that could potentially limit hardware sales. They resist putting ROM serial numbers, execute-only microcode, or any other schemes into their machines that would render copy protection truly effective. Hardware manufacturers are not obligated to make their products completely backward compatible. IBM, for example, specified floppy disks that had 40 tracks. Experimenters found that the drives would actually access a 41st track, and some copy protection schemes were created using the 41st track. Then IBM got a new supplier who built drives exactly to the spec. You buy a new PC and whammo, your most critical program doesn't work anymore.

So when I speak of Microsoft as a good citizen, I mean it. You can be sure it has come under pressure from the companies that are still copy protecting. Fortunately, it cares more about what you and I think than about Lotus and Ashton-Tate's opinions. And where Microsoft leads, other companies will follow.

NEW FACES DEPARTMENT You'll notice that we have a new columnist in this issue, Stewart Alsop II. Stewart has been a computer journalist for as long as there have been personal computers to write about. Today he edits and publishes a respected industry newsletter called *P.C. Letter*. He is widely known as a "whip," who encourages manufacturers to produce products that are good, not good enough.

In fact, Stewart is one of the half-dozen people who can lay claim to having coined the term *vaporware*. His celebrated "Vaporlist" in his newsletter chronicles the (often-wide) gulf between the dates products are announced and when they are actually delivered. It is a testimony to the respect the industry has for Stewart that after 24 months of putting Microsoft's feet to the fire over its perpetual delay of *Windows*, he was invited to be one of the tuxedoed "roasters" at its final introduction.■

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CIRCLE 367 ON READER SERVICE CARD

AW . . .

WHAT THE HECK!

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ProDesign II is one of the most advanced CAD packages available for microcomputers. We think it's absolutely the easiest to use. With competitive CAD systems priced at $1500 to $2500, we were posed with the problem of setting our price.

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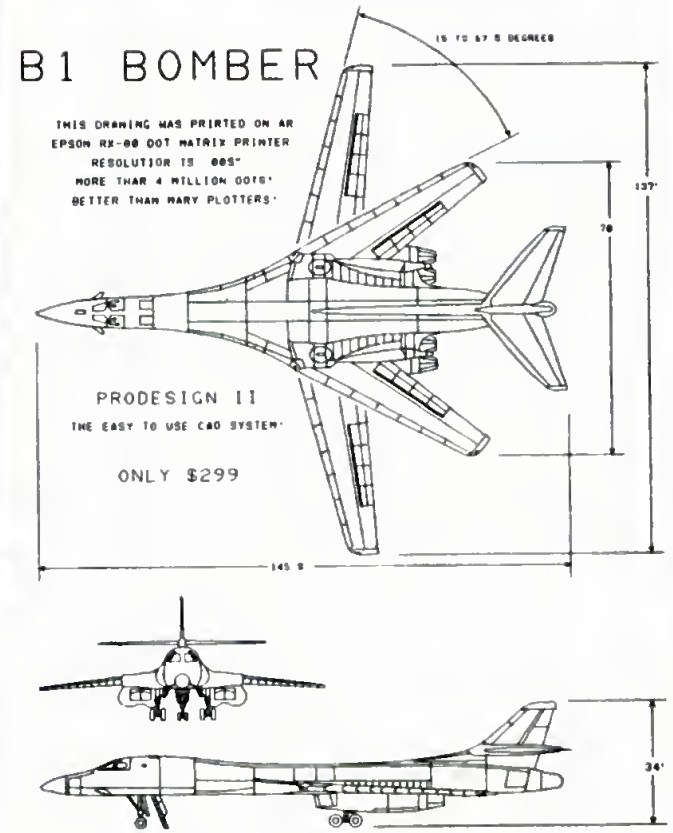
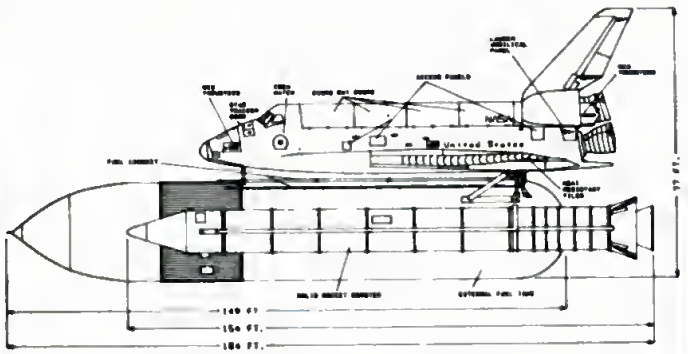
AW...WHAT THE HECK!

$299.95





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ORIENT DIRECT

How do you suppose most manufacturers of personal computer products get started?

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Now, we always figured that there were some pretty substantial markups as these boards came into the country and got fancy boxes and marketing promotions under any one of a number of well known brand names in the peripheral add-on markets *but we had no idea they were so large!*

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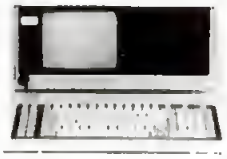

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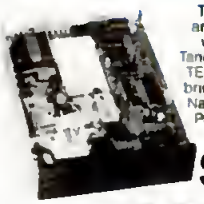

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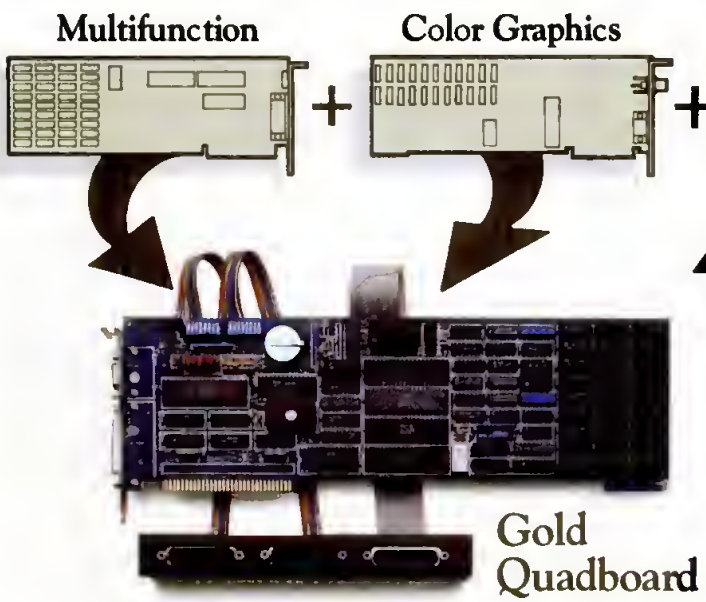

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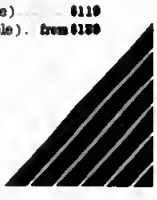

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DOS utilities don't always give you an accurate picture of the actual size of your files. The six Softstrip™ data strips on the right contain two programs called SIZE and FREE, by Art Merrill, that appeared in the January 1986 issue of PC. They are designed to help you know just how much space you really have on your disk.

Have you ever tried to move 300K onto a newly formatted disk? You know there is about 362K on the disk, but you get the dreaded "Insufficient disk space" message. DOS utilities report the actual size of the files, but not how much room they require in a subdirectory or on a disk.

SIZE.COM shows you the actual storage requirements of your files when you are backing up or copying files. FREE.COM lets you know how many bytes have been allocated and how many are still available. It's much faster than running either DIR or CHKDSK.

Using SIZE and FREE is really quite simple. Both have just two parameters, the drive and directory that you want to read the files into. To learn more about these programs turn to page 221 of the January issue.

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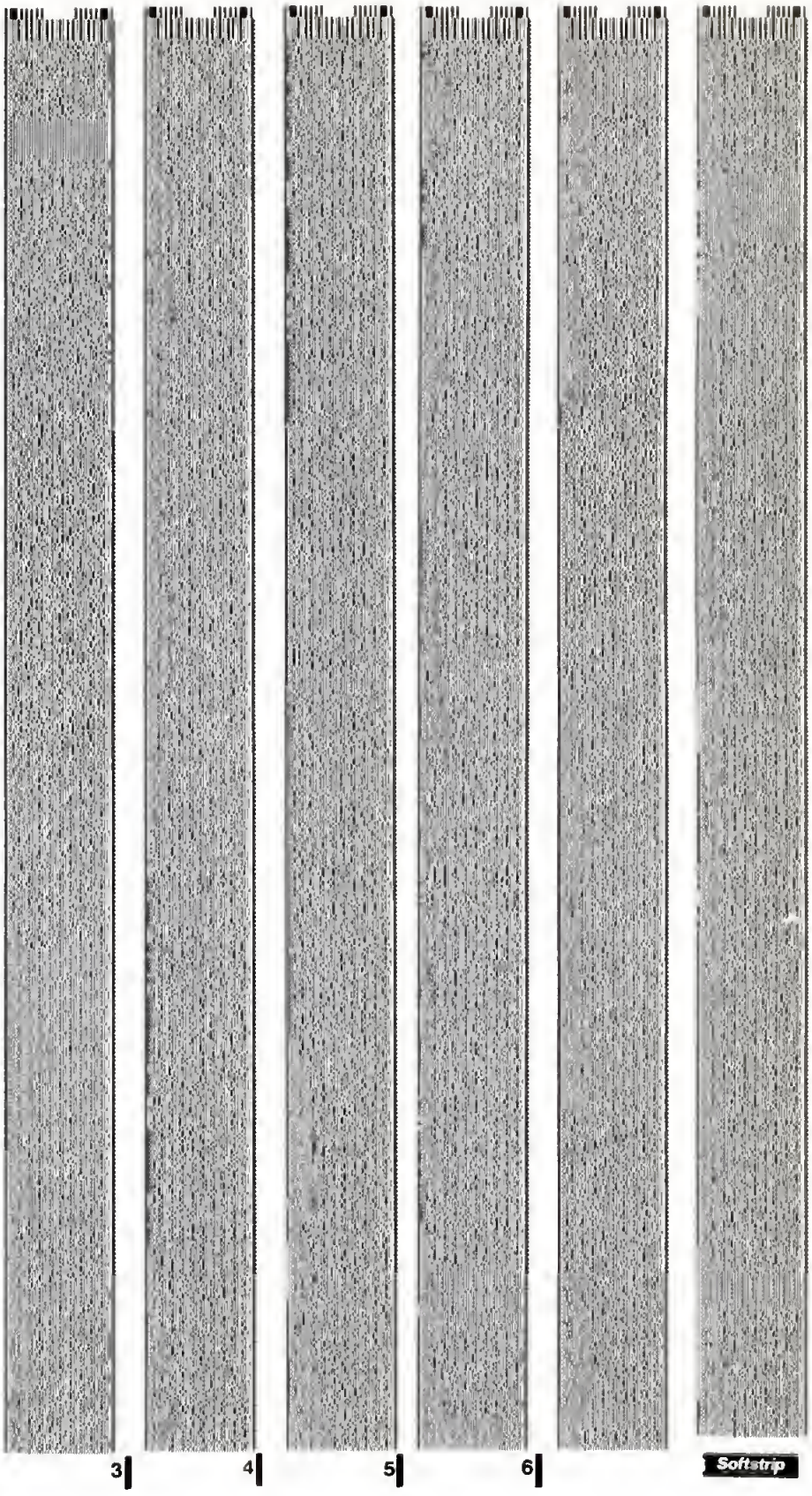

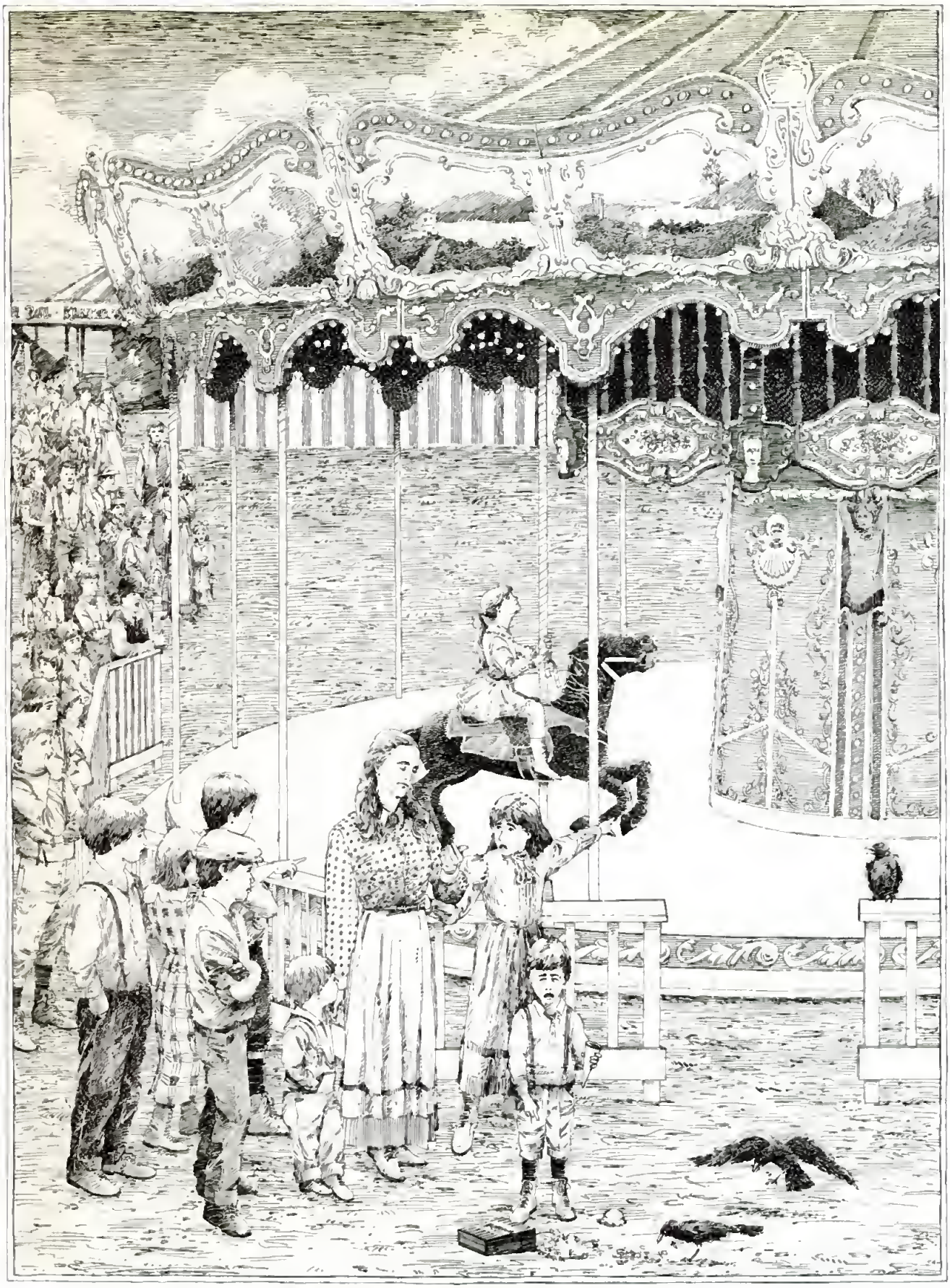

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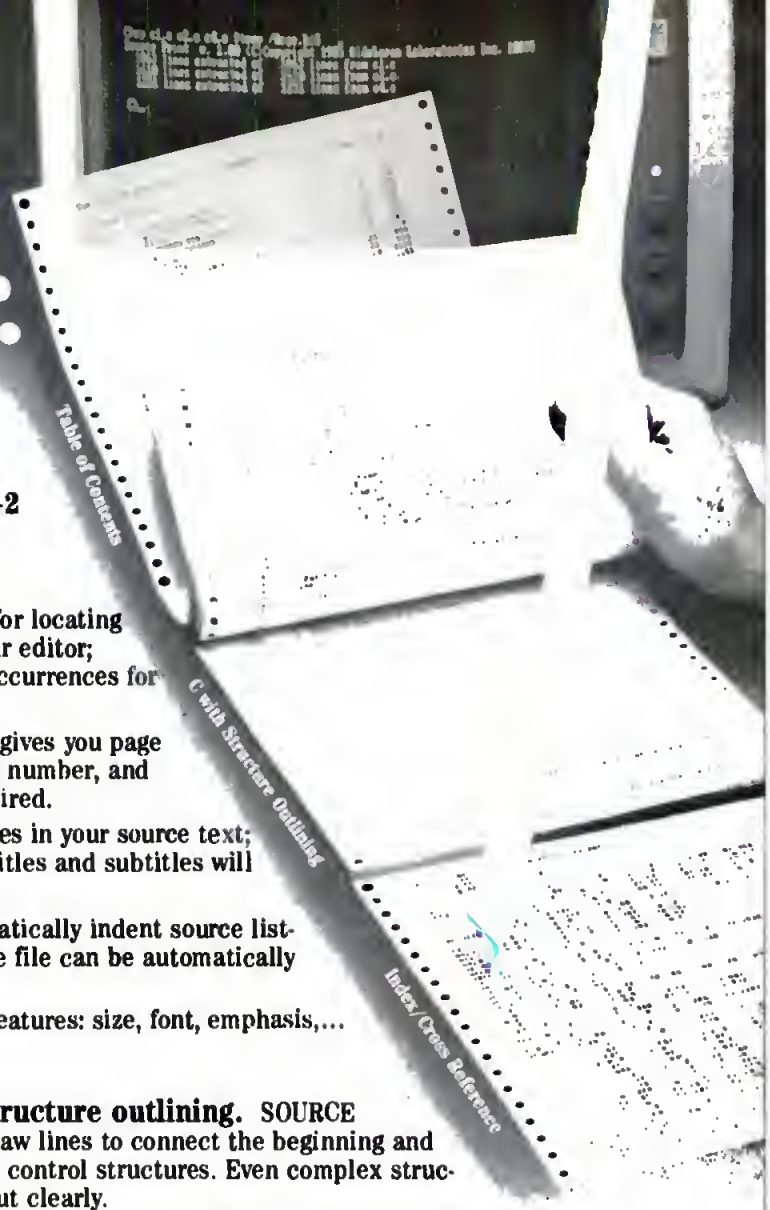

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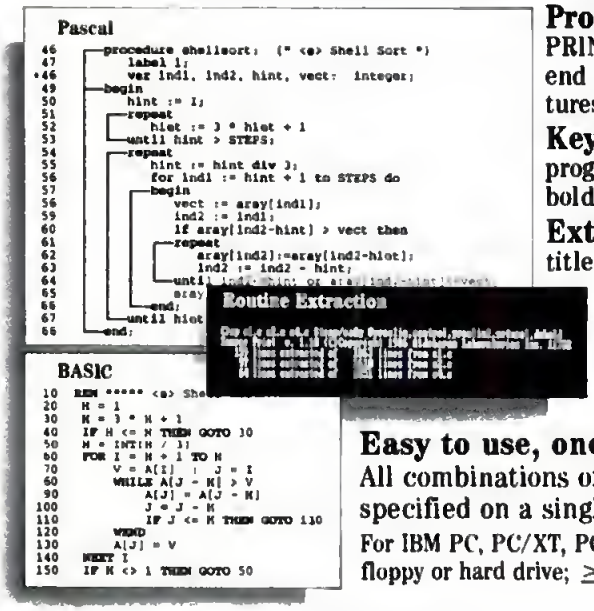

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A STANDARD IN THE MAKING

A glimpse into the birth of what may become a new standard for making memory-resident programs more cooperative with one another.

I've just had the opportunity to glimpse something that may well turn out to be a major force in the next generation of PC software. I found it so exciting that I want to interrupt my series on disk disasters so that I can tell you about it.

The new development has to do with memory-resident programs: the *SideKicks*, *ProKeys*, *SuperKeys*, spoolers, *Ready!*s, and MODEs that we all use.

Resident programs install themselves semipermanently into the computer's memory. Once they've been invoked, they stay present, and active, in memory as long as the computer is running. (Rebooting the operating system, of course, clears away any resident programs that were loaded.)

A MULTITUDE OF RESIDENT PROGRAMS More of these resident programs exist than many of us are aware of, even though we use quite a lot of them. Of course, the pop-up variety, like *SideKick*, is obvious. But if you use a keyboard macro program like *ProKey* or *SuperKey*, it's easy to forget that it is working for you offstage.

Even parts of DOS work as resident programs. At least nine DOS commands are really resident programs, although some of them are in disguise. PRINT is obviously a resident program, since it works after you've told it to print out some of your files. The MODE program, which can, among other things, redirect your output from one printer to another, is resident. So is the GRAPHICS program, which makes the PrtSc command work for graphics images, and GRAPHTABL, which adds special characters to the graphics mode. The KEYBxx programs, which adapt to other language keyboards, are resident and so is the SHARE program, which is used with file sharing and locking. Also resident are the trio of commands that manipulate drives and directories: ASSIGN, JOIN, and SUBST.

I don't think of myself as much of a resident program user, yet when I checked my system I found that I use at least five of them routinely: PRINT and MODE from DOS, *SideKick* and a keyboard enhancer, plus IBM's *File Facility*, one of the many programs that brings the PATH concept to finding data files. I'm sure plenty of PC users typically use more.

TERMINATE BUT STAY RESIDENT Programs are able to become resident thanks to a valuable DOS facility called "terminate but stay resident." When DOS runs a program, it loads the program into memory above the part of memory that it uses itself; when a program ends in the ordinary way, the memory the program used is free for use by another program. But when you finish running a program with a "terminate but stay resident" request, DOS leaves the program in place and loads subsequent programs into memory above the newly resident part. In effect, the resident program has integrated itself into DOS, or at least assumed DOS's privilege of remaining in the computer's memory while other programs run.

Once a resident program has "terminated but...," it's no longer active in the sense that ordinary programs are active. The computer gives an ordinary program its full attention and computing power. A resident program, however, stays dormant until some event—that is, an interrupt—activates it.

MONITORING AN INTERRUPT Generally, each resident program interposes itself into one of the computer's standard interrupts, either a hardware interrupt, such as those that occur when you press a key, or a software interrupt, such as the ones your programs use to request services from DOS. A resident program doesn't completely take over an interrupt, however; it just monitors it, waiting for a specific event to occur. For example, a keyboard macro program will monitor the keyboard hardware interrupt. On the other hand, DOS's MODE command monitors the DOS interrupts when you ask it to reroute output from LPT1 to COM1. If the

Illustration: Tom Sciacca

■ PETER NORTON

event it's waiting for occurs, the resident program takes the initiative and swings into action; if not, it passes the interrupt on to the routine that would otherwise have received it.

A SPIRIT OF COOPERATION For this whole scheme to work, each resident program has to cooperate with and not disrupt the others. But that ideal hasn't always been the case.

Some resident programs were writte as if they were the only ones—a ve shortsighted approach. Fortunately, mc of these nearsighted programs have disa peared. However, the task of writing fully cooperative resident program is easy. There are many subtle ways th programs can trip over one another. It': though a troupe of dancers or jugglers w performing all together in a dark room, ing not to get in each others' ways. E resident program is unaware of the ot and doesn't know how to avoid them cept through bruising experience.

That's why so many of you have h learn by trial and error which residen grams can work with which other and in what order they must be loa

■ Like jugglers perfor ing in a dark room, ea resident program is unaware of the others and doesn't know how to avoid them except through experience.

work properly. Although resident programs are improving and do work together better than they used to, lots of problems still crop up—including the annoying fact that you can't remove one from memory if you've loaded another one after it.

A NEW STANDARD Fortunately, assembly language wizard John Socha has begun work on a solution to this problem. And he's given us a peek into PC history in the making.

John Socha is one of the cleverest programmers I've ever met and a good explainer of assembly language. I've often recommended his book *Assembly Language Safari*. While John was revising his book and preparing advanced assembly language material, he began writing a chapter on the special problems involved

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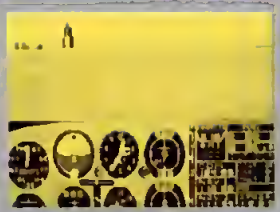
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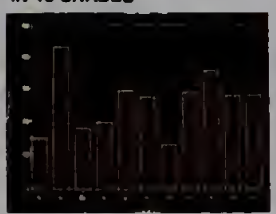
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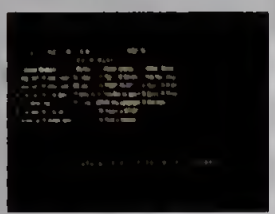
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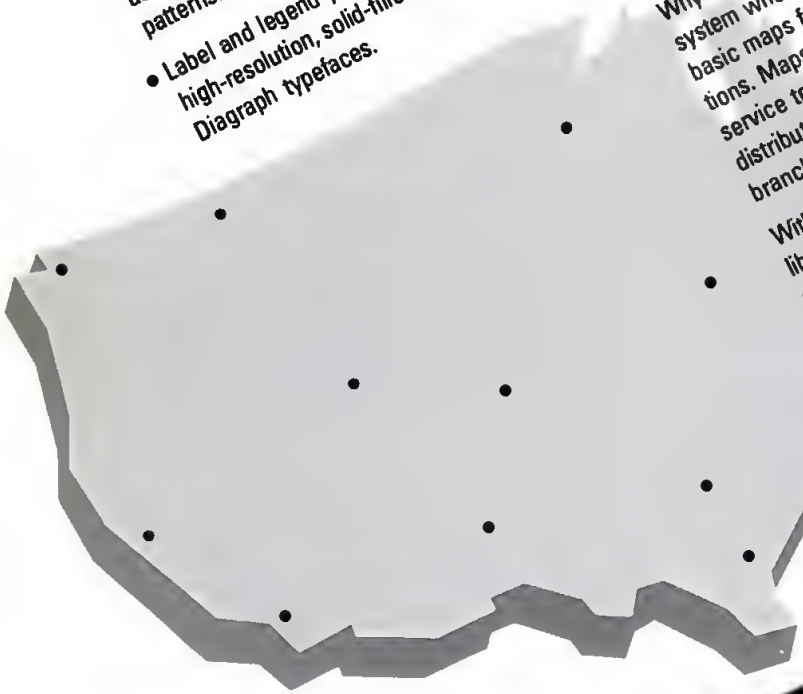

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■ PETER NORTON

in writing resident programs. In thinking about it, he contacted the one resident-program expert that he already knew, David Rose, the creator of *ProKey*. Putting their heads together, they came up with the idea of a software specification that would make resident programs aware of each other, work together more cooperatively, and remove themselves when they weren't the last program loaded.

Thus, a hot idea was born, but nothing happened. Shortly thereafter, John began working with me on a few projects and mentioned the idea. I encouraged him to write a formal specification and begin working with the real heavyweights in this game, particularly Phillippe Kahn and Bill Gates, the geniuses behind Borland and Microsoft, respectively.

■ Although resident programs are improving, problems still crop up, including the fact that you can't remove one from memory if you've loaded another after it.

Specifications like this—for example, the Lotus-Intel-Microsoft specification for expanded memory—don't get created overnight, or by one single person, no matter how talented. So John is now in the process of presenting his draft concept to Microsoft, Borland, and others in order to gain the benefit of their experience, to tailor it to their needs, and to persuade them to join in making this a common, industry-wide specification for resident programs.

Since this project is still unfolding, there's no telling how it will turn out. But that's part of its excitement. The effort may not succeed—for reasons technical or political—or it may become, as I expect, an important contribution to the advancement of personal computing. It may bear the name of the man who set it into motion—something like "the Socha Resident Program Specification"—or credit to him may get shoved aside in the rush of others trying to get their names attached to the specification. It's all part of the evolution. After all, we don't have the name of the one person, if there is one, who started the Lotus-Intel-Microsoft spec.

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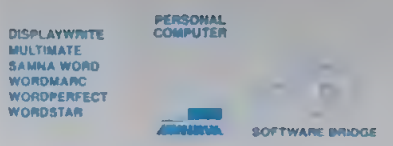

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■ JIM SEYMOUR

DESIGNING THE CONDENSED PC

With desktop real estate at a premium, vendors are eager to get their two-shoebox-sized computers on the market. But downsizing has its problems.

In my last column, I looked at some of the former "options" we're likely to see built into succeeding generations of PCs, both those from IBM and those from the folks who think they can do it a little better or a lot cheaper.

One of the delicious ironies of that pack-it-all-in approach is that the new PCs' boxes, or system units, are going to be a good deal smaller. While a lot of pundits are talking about 2-megabyte PCs, a lot of vendors and PC buyers are talking about 2-shoebox PCs.

Desktop real estate counts. Whether on the credenza behind an executive's desk, on your makeshift worktable at home, or on a secretary's narrow "typing return," today's PCs—especially the PC AT–class machines—simply take up too much space.

HIGH PERCEIVED VALUE Because we all need, or think we need, more workspace than we have, a substantially smaller machine is going to have a higher perceived value for many buyers than today's suitcase-sized system units. Vendors generally love that kind of higher-price/greater-perceived-value situation—not least because these new-generation PCs are going to be cheaper to build than present AT-style PCs.

With the result that vendors are eager to get their "baby ATs" to market. I know of six computer firms frantically working to get a smaller-box AT onto the market; I'd guess there are at least as many I'm unaware of working just as hard.

It's not a problem with an obvious or necessarily tidy solution. PC makers are constrained by several minimum dimensions if they're to accommodate the realities of the market and the state of the technology.

One such constraint is the space required for floppy and internal hard disks. Even with the smaller "form-factor" of 3½-inch floppy drives—and it's far from clear that the universe of IBM PC–style users is ready to embrace 3½-inch microfloppies—certain height, width, and depth requirements must be met. There's less of an acceptance problem with 3½-inch hard disks: What you don't see, you don't complain about. But these still aren't vest-pocket devices.

Power supplies are bulky, too. Lower power requirements from CMOS chips will reduce the size (and weight) of PC power supplies somewhat, but here you and I are a large part of the problem: No matter how power-efficient the designers make the machine, and no matter how many features they cram into the box, you and I are going to want to stuff it full of power-hungry add-ins. Everyone in the business remembers the (retrospective) idiocy of that lame 62.5-watt power supply in the original PC and the problems it caused for users with the temerity to actually try to use a few of the expansion slots in the box; no one wants to relive that grief.

If you're going to allow full-length PC add-in cards, the card-cage portion of the chassis has to have a certain height and front-to-back depth—unless you turn the cards sideways and run them behind the disk drives and power supply (aggravating the front-to-back depth problem) or lay them across the top of the chassis (aggravating the width problem). I know designers trying both those solutions, and I don't like what I've seen of them so far.

Displays are targeted for downsizing, too. My guess is that we'll see something very much like the elegant, astonishingly crisp Princeton HX-9E 9-inch EGA-compatible color monitor sitting atop the new small PCs.

The keyboard is the final and probably inescapable size constraint in hatching smaller PCs. Every experiment I've seen with tighter key spacing, more compact arrangements, repositioned function keys, and other apparently sensible means of packing QWERTY in a smaller rectangle has gone aground. Though we may hate IBM's perverse rearrangement of the keys in the original PC keyboard and Blue's dopey repositioning of the Esc key on the otherwise-much-better AT board, we've

Illustration: Tom Sciacca

■ JIM SEYMOUR

shown with our checkbooks and purchase orders that we don't want rearranged keyboards.

The motherboard, oddly enough, has been one of the easier problems in downsizing ATs. Leaving space for expansion-slot connectors and deciding how much memory to install on the motherboard are the main problems.

The new higher-capacity RAM chips are the easy if costly answer to the memory problem. The self-destructive pricing policies of chip vendors will drive prices down soon enough.

A no-slot machine seems an obvious answer to the demand for smaller PCs, and we'll probably see some feints in the no-slot direction. But I fear the marketplace is ready to smite anyone who tries that path.

A very compact no-drive machine intended for connection to LANs, the legendary "diskless PC," is another good idea that is waiting to devastate some earnest firm that believes that rationality and good judgment reign supreme in the PC marketplace.

■ A no-slot machine seems an obvious answer to the demand for smaller PCs. But I fear the marketplace is ready to smite anyone who tries that path.

STEPS TOWARD SMALLER PCs

We've already seen some interesting steps toward smaller PCs. The Leading Edge Model D, an original PC clone, has been selling well mainly because of its $1,495 list price, but also in part because it's relatively compact, a rational and appropriately sized second or "home" machine. The dazzling little machines from Apricot—the neatest of which looks like the latest thing in Sony tummy TVs—are enormously appealing, if a little short of PC compatibility and way short of AT-level functionality.

IBM, of course, either did or didn't start all this with the unicomlike PC II, which did or didn't exist last year. A smaller, cheaper, full-function AT-level PC may not have fit into IBM's marketing plans—but it sounds awfully good to a lot of the competition.

And to a lot of PC buyers, too. ■

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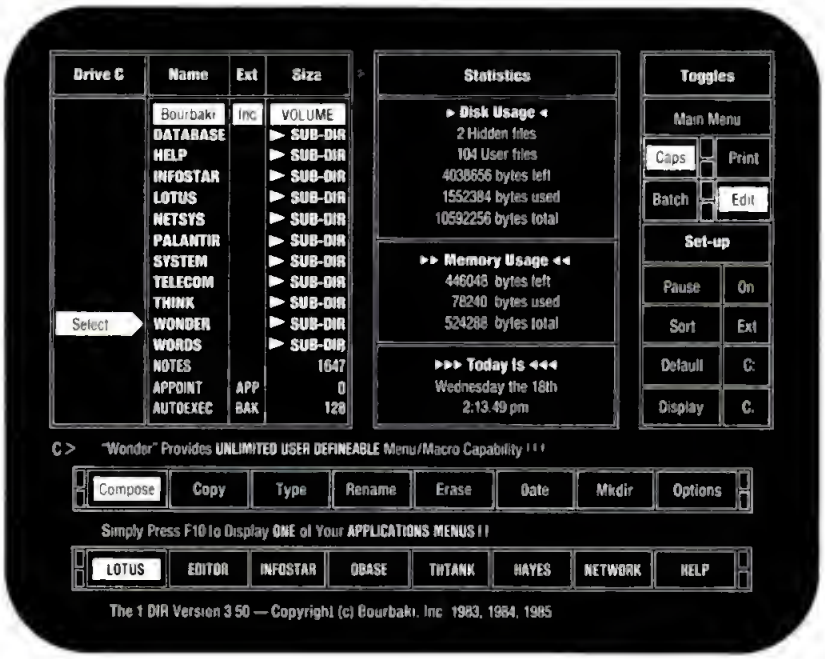

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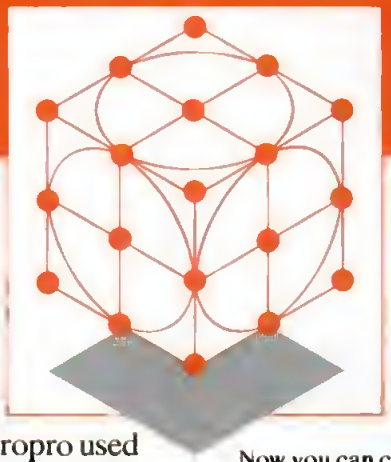

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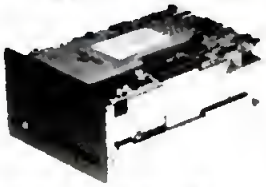

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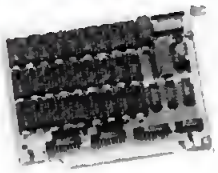

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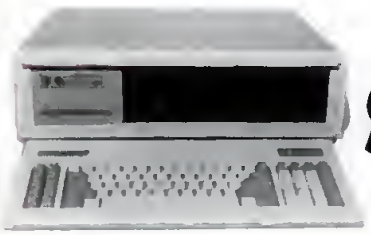

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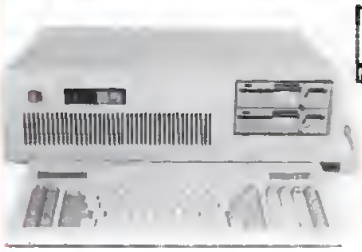

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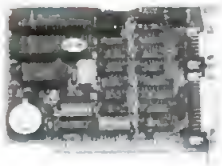

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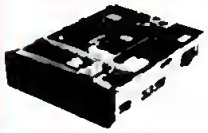

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DOWN MEMORY LANE

What to do with several megabytes of memory is a big question; how to manage it is another. Programs using the EMS spec currently give us the most convenient answer.

What has 36 16K-bit RAM chips, 72 64K-bit chips, and 72 256K-bit chips, totaling more than 2.5 megabytes of memory? The 4-year-old PC I own.

A few hundred years from now, George Jetson's archaeologist uncle is going to be absolutely amazed at the successive layers of obsolete stuff in this box—a history of the microcomputer in miniature. Thank open architecture, cheap chips, the 20-bit address lines of the Intel 8088, and especially the entrepreneurs who understood the wonders of RAM even when IBM didn't. To this day, Big Blue does not manufacture a memory expansion card that anyone in his right mind would consider using.

But the same naysayers who sniffed when I originally upgraded my machine from 64K to 576K are sniffing again. What can I possibly do with 2½ *million* bytes of memory? What good can it be?

Well, a mere 640K seemed an unimaginably enormous amount of RAM back in the days when the base-model PC was a cassette-based machine with a whopping 16K of RAM. *WordStar* from floppies in 64K was obviously all you'd ever need.

That is, until RAMdisks and *ProKey* and spoolers and bigger DOSes came along. For a while, everything squeezed into the big new boundaries—until *SideKick* and its friends dropped by. Paring down the RAMdisk and spooler bought room, but not enough to use 256K programs without some deinstallation.

In these times of memory residence, multitasking, and behemoths requiring a minimum of 512K bytes for themselves, 640K looks positively puny. Go ahead: Try loading fully configured DOS, *1-2-3*, *SuperKey*, *SideKick*, *Turbo Lightning*, and *TopView* all at once. Just try.

STRETCHING YOUR MEMORY

Folks with machines like the AT slaver at the prospect of a DOS that can run software in the 80286's protected mode, which can address 16 megabytes. From the looks of things, their drool may become chronic.

But right now any PC owner can upgrade with one of the new boards using the Lotus/Intel/Microsoft Expanded Memory spec or the AST/Quadram superset of it. Both use variants of a technique called "bank switching," originally popularized on the ill-fated Apple III.

Essentially, bank-switching software swaps hunks of data between memory (below 1 megabyte) accessible to the 8088 microprocessor and up to 8 megabytes of memory otherwise inaccessible to it. Code and data can participate, and although there's some overhead involved in the swapping, it all takes place at RAM speed, so you are unlikely to notice.

Software expands to fill available memory; expanded memory rises to the task. Take *Paradox*. *PC Magazine*'s reviewer pointed out that the program itself needs 512K bytes of RAM to run, not to mention space for DOS and extra DOS buffers and files (see "Paradox: A Database Manager with a Familiar Face," *PC Magazine*, Volume 5 Number 1).

"Forget about RAMdisks," he concluded. "You might even find it hard to use print spoolers in RAM or RAM-resident programs. . . ." True, too true, when he wrote the review a few months ago. Today, you can stick your RAMdisks and spoolers where the DOS don't shine—in expanded memory.

Expanded memory also hangs out a welcoming "Watch this space for future development" sign for memory-resident programs. It's a safe bet that most good ones will soon embrace the spec, installing a tiny kernel in the DOS-approved 640K and calling themselves up from expanded memory as needed. At least two programs do so right now: *Ready!*, Living Videotext's outliner, and *Lightning*, Personal Computer Support Group's disk cache program.

WORRY-FREE BANK SWITCHING

Lightning, not to be confused with Borland's boring *Turbo Lightning*, is a useful

■ STEPHEN MANES

DOS extension—sort of half a RAMdisk without the bother. It's essentially a disk cache that can be as big as 1.3 megabytes and works with floppy or hard disks. The first time a program reads a file, *Lightning* leaves it in memory; every time you reuse unchanged data, it comes back at RAM speed instead of requiring a disk access.

Lightning is conservative, however, about writing data: Unless a sector to be written is utterly unchanged, the program gets it to disk immediately. This technique sensibly trades peformance for safety, minimizing the chance that a modified disk directory or file allocation table might be lost in the cache during a momentary power outage.

On a PC or XT, the speedup is noticeable, particularly with indexed databases and spelling checkers in which you're reaccessing the same data repeatedly. The nice thing about *Lightning* is that you don't have to worry about it. Unlike a RAMdisk, it gets data to physical safety automatically. If you've got expanded memory, *Lightning* finds and uses it; if not, it sticks to regular RAM.

THE FUTURE OF EXPANSION I suspect programs like this are the real future of expanded memory. The EMS spec was originally touted as a means of keeping programs that support it from running out of space. Giant *1-2-3*, *Symphony*, and *Framework* documents are now possible for the few who need them. But far more potentially useful are items like an announced version of the multitasking *DESQview* (one of the few programs currently requiring the AST/Quadram spec) that can swap programs in and out of expanded memory.

Plain-vanilla multifunction cards should now go the way of the dodo. Many expanded memory cards include a clock as well as serial, printer, and game ports. Most can be set up to fill whatever portion of the DOS-addressable 640K your system now lacks. Most come with RAMdisk and spooler software.

The price is right, too, as long as you don't pay the "we're-just-kidding" lists or the exorbitant tariffs that manufacturers exact for installing RAM. I bought a 256K board and had the mail-order dealer load it with 2 megabytes for the grand total of $532; a multifunction add-on will set me back a munificent 80 bucks.

The expanded memory spec can handle up to 8 megabytes. When 1-megabyte chips come along, those 8 megabytes will all fit on one board. Of course, by then there just may be a PC2 that can directly manipulate as much as, say, 16 megabytes. But what could we possibly do with all that memory? ■

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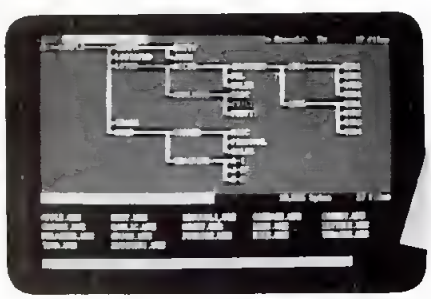

You can sort five ways, including alphabetically. Its search function is so fast, it can locate the file you want in less than two seconds! Even if you don't remember the file's exact name, KEEPTRACK will find it! Full on-screen help is always a keystroke away. And all this is just a small sample of how KEEPTRACK can solve your PC problems.

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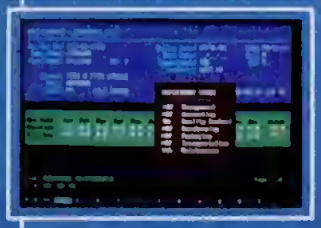

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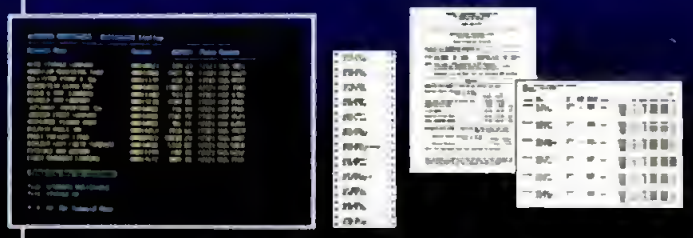

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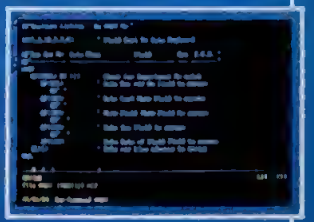

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■ STEWART ALSOP

A CHALLENGE TO COMPAQ

With this issue, veteran writer and editor Stewart Alsop begins a new column, offering insights into the forces that help shape the hardware and software marketplace.

I want to publicly challenge Rod Canion, president of Compaq Computer, to put his money where his mouth is.

I like Rod Canion because he's a straightforward fellow who's focused on delivering products of real value to buyers. But recently Canion has sounded off about Apple's fatal mistake in not making the Macintosh computer compatible with the standard IBM architecture.

So here's my challenge to Canion: Why doesn't Compaq do that? Why doesn't Compaq introduce a computer that operates with Intel chips, uses Microsoft's operating system, and is totally compatible with IBM's personal computers and that's as easy to use and learn as the Macintosh? What's most fascinating about this question is that it is indeed possible to create a Macintosh-like PC-DOS computer, using existing technology and a little engineering talent (which Compaq has in spades).

Whatever you think about the Macintosh, Apple has managed to establish ease of use as a competitive advantage, one that persuaded nearly half a million people to buy what's widely been considered a slow, unexpandable, incompatible computer. That's not a bad little market for a new computer, particularly for a company like Compaq that's looking to keep up its torrid growth rate. If Canion isn't full of hot air, here's how Compaq's next computer should be designed:

First of all, the computer needs an interface that achieves the same objectives as the Macintosh's Finder but operates on MS-DOS. There are three choices here: IBM's *TopView*, Digital Research's *GEM DeskTop*, and *Microsoft Windows*. *TopView* isn't much of a choice because IBM isn't likely to give Compaq a lot of help designing a machine to run it and neither developers nor users seem too excited by the product. *GEM DeskTop* might be a good choice: It runs fast, emulates the Macintosh interface (a little too faithfully, according to Apple), and offers much of the same utility as the Macintosh's Finder. But *GEM* is now the standard interface on Atari's new 520ST computer, and Compaq isn't likely to want to make a machine that might get confused with Atari's.

That leaves *Microsoft Windows*, which after all isn't a bad choice. Microsoft is a solid company that says it's making more money than any of the other big software companies, and most developers say that *Windows* ended up being a solid solution to the problem of providing a common interface for PC-DOS applications, despite its delay in development.

Illustration Tom Sciacca

So what would a machine need to run *Windows*? (Let's call this machine the ApplEater.) It would have to include the basic parts of the unenhanced PC AT: an 80286 processor plus that machine's BIOS and architecture. It would also need bigger ROMs so as to stick parts of MS-DOS and *Windows* into permanent memory.

Of course, Compaq needs to make ApplEater cute so it will compete on equal grounds with the Macintosh. That means it needs to be small, very "personal" looking, and semitransportable. Forget about slots for add-in boards and instead outfit the computer with a Small Computer Standard Interface (commonly known as a "scuzzy interface"), which gives peripheral developers direct access to the data-handling speed of the motherboard for their products (hard disks, extra memory, video equipment, and so forth). The computer should offer both serial and parallel ports for printers and modems and should probably have the token-ring network interface and port built in. ApplEater has to come with a mouse and, to save space internally, should probably use two 3½-inch floppy-disk drives (double-sided, of course, so the disks will hold 720K bytes) instead of the 5¼-inch disk that's more common in the PC world.

Compaq would also want to give ApplEater at least a megabyte of memory, which poses a challenge, because MS-DOS can't currently address more than 640K bytes of memory directly. That leaves two choices: either wait until Microsoft develops a version of MS-DOS that can run in "protected mode" on the

■ STEWART ALSOP

80286 and, therefore, will be able to address up to 16 megabytes of memory directly; or build the Lotus/Intel/Microsoft Expanded Memory Specification capability right into the motherboard. Since we don't know when Microsoft might introduce a protected-mode DOS, let's just use the expanded memory spec and build in 640K bytes of high memory plus a megabyte of expanded memory.

Next, ApplEater needs graphical capabilities, for which four separate standards now exist in the MS-DOS world: IBM's monochrome, color, and enhanced graphics, and Hercules' monochrome graphics. Video 7, a little company in Milpitas, California, has figured out how to put all four on one board, so Compaq could buy the design from Video 7 and stick it all onto the motherboard. But the IBM Enhanced Graphics Adapter is rapidly becoming the primary target for software developers, so Compaq might as well just go to a company called Chips & Technologies (also in Milpitas), buy its EGA chip set, and put that on the motherboard along with the monochrome graphics that Compaq computers already offer as a standard feature.

ApplEater's display is a problem. The Macintosh has such a crisp display because it contains its own monitor, one which is physically smaller (9 inches instead of 12) and has an odd aspect ratio. Compaq could build a proprietary high-resolution color monitor into the computer but that adds a lot to the initial price. It's better to leave that option to the buyer, but be sure that buyers can attach any kind of monitor to the machine (like Commodore has done with the Amiga).

Now, of course, the important question: How much would this item cost to build? On a very rough basis (which means I could be wrong by as much as 20 percent in either direction), I think a company like Compaq could build and sell ApplEater for about $3,000 and still make money, particularly if it could sell 10,000 or more units per month. A similar configuration of a basic, inexpensive PC AT-compatible computer (Tandy or Epson) would cost the consumer nearly $5,500. And, that doesn't include the extra ROM, the 3½-inch disks, the transportability (although the more-expensive Compaq 286 portable does offer transportability), or the cuteness of the Macintosh.

Next issue, what selling ApplEater would do to Compaq's competitive and strategic position in the marketplace. ■

Stewart Alsop is editor and publisher of P.C. Letter, *a twice-monthly newsletter that reviews events in the personal computer industry. He is based in Redwood City, California.*

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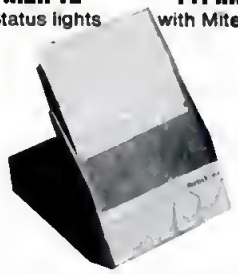

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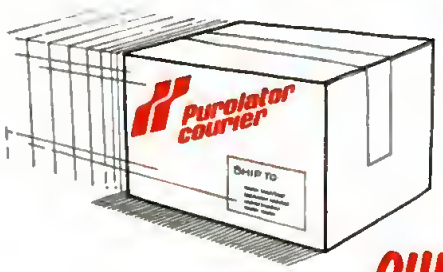

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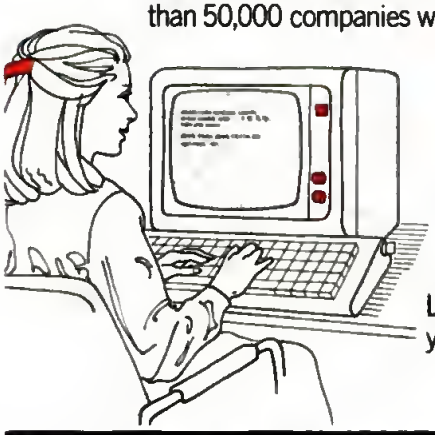

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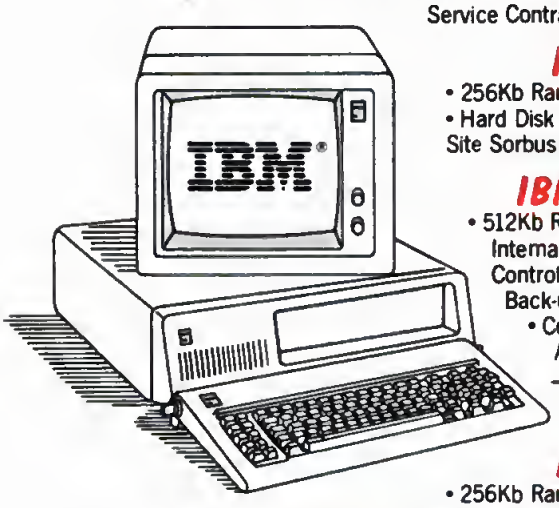

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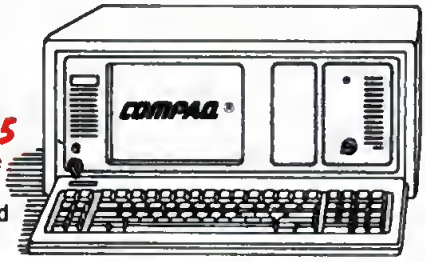

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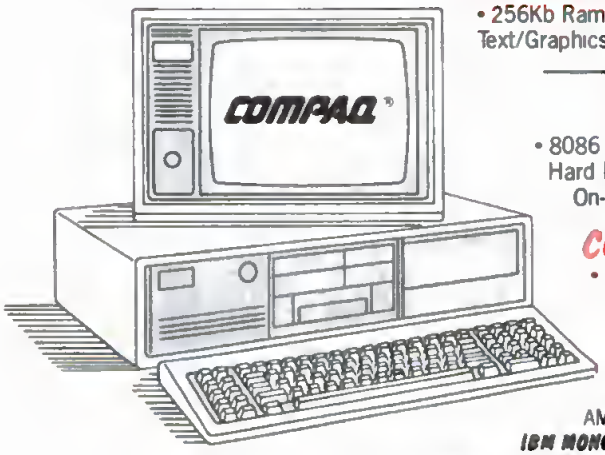

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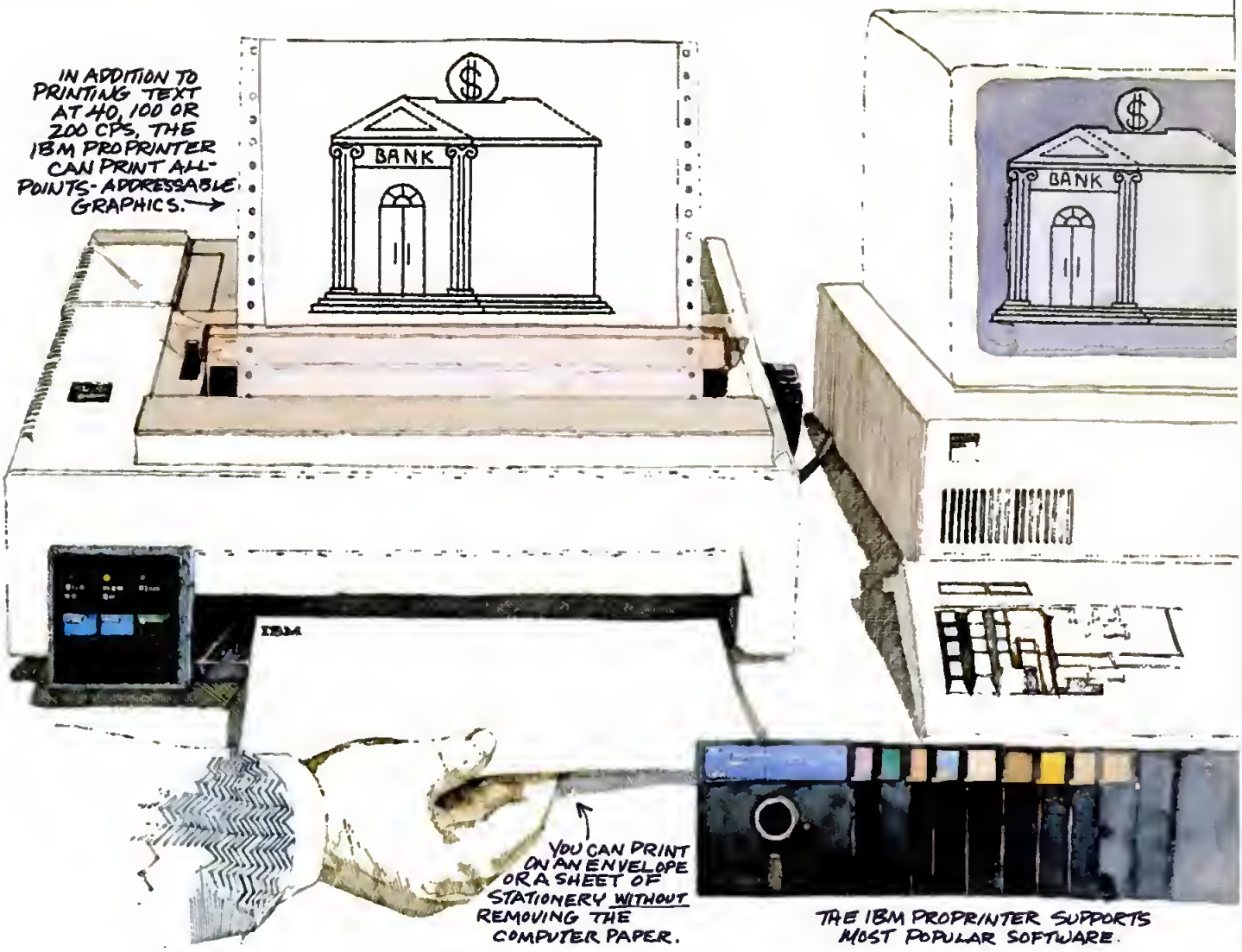

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CIRCLE 164 ON READER SERVICE CARD

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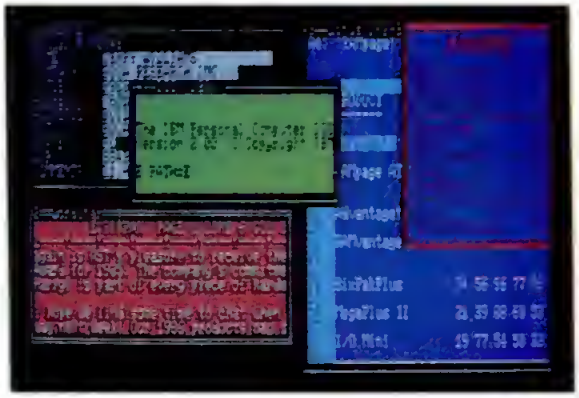

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introduces the 640K barrier.

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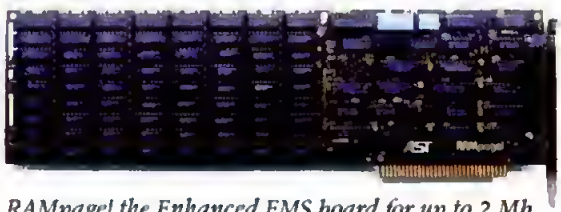

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CIRCLE 104 ON READER SERVICE CARD

■ COVER STORY PC MAGAZINE CHARLES PETZOLD

The IBM Enhanced Graphics Adapter is rapidly becoming a new standard. If you want to upgrade your monitor to match, here are some good alternatives.

THE EGA STANDARD:

MONITORS THAT MEASURE UP

Perhaps you weren't thinking much about color and graphics when you originally purchased your PC. After all, color and graphics are for games, aren't they, and you wanted to do word processing, spreadsheets, and database management.

Photograph: Craig Cutler

THE EGA STANDARD

Yet more and more new software goes beyond the capabilities of a simple monochrome text display. Almost every spreadsheet program can show graphs on the screen, resident pop-up programs use color for their windows, and even word processors like *Microsoft Word* use graphics for on-screen italic and boldface text.

A more interesting development is the Macintosh-like desktop interfaces of *Microsoft Windows* and Digital Research's *GEM Desktop*. These operating environments point the way to a uniform user interface that uses color and graphics to great advantage. Some industry leaders (most notably Microsoft chairman Bill Gates) feel strongly about this trend. It is not inconceivable that 5 or 10 years from now, a bit-mapped graphics interface will be pervasive in all types of applications programs and even DOS itself.

For this reason, the Enhanced Graphics Adapter (EGA) is one of the most important peripherals IBM has introduced for the PC. It is the right piece of hardware to support this new breed of software (see sidebar "The EGA Board"). And because you spend most of your time looking at the display rather than at the adapter itself, you'll find that the choice of a monitor for the EGA will be an important part of upgrading to this new graphics standard.

THE GRAPHICS GAP The importance of the EGA is particularly evident if you consider what you were stuck with before the EGA was born.

From the birth of the IBM PC, the IBM Monochrome Adapter and Display were usually the first choice for corporations and individuals doing mostly word processing, spreadsheeting, communications, and database management. It has a nice, clean, readable font in a 14-line by 9-dot character box and looks a lot like the green screens on the IBM 3278 mainframe terminals that many corporate users are accustomed to.

But the IBM Monochrome Adapter can't do graphics and can display only four "colors": black, green, bright green, and blinking green. The biggest drawback of the Monochrome Adapter and Display arose when corporate users tried to display *1-2-3* graphs and found they could not. This problem helped a company called Hercules sell a quarter-million monochrome graphics cards to do graphics on the IBM Monochrome Display.

The IBM Color Display, teamed with an IBM Color/Graphics Adapter, was for a long time IBM's only alternative to monochrome. In text mode it can display 16 colors, which is fine for most purposes. But since the characters are squeezed into an 8-by 8-dot box, executives and managers often find it difficult to read.

Moreover, the graphics capability is very limited. Software can use graphics in only one of two modes. The first (used mostly by programs such as *1-2-3*) can display just four colors in 200 lines of 320 dots. Text displayed in this mode can only fit in 40 characters per line. In the higher-resolution mode (used by programs with a greater text requirement, such as *Microsoft Word*), only two colors are possible. Like the earliest cars and telephones, the background can be anything you want, as long as it's black. Software can change the foreground color but generally keeps it white.

The bottom line is that when you're using graphics in a reasonable resolution of 80 characters per line, the IBM Color/Graphics Adapter takes away color, and you're left with an essentially monochrome display. What the market needed was a combination of high-resolution graphics and lots of color.

Companies like Tecmar, AST, and Quadram tried to supply this combination with their own high-resolution color graphics adapters. But any new video adapter requires software support, and none of these adapter cards came close to becoming an industry standard. Something was missing—or, more precisely, three things were missing: I, B, and M.

THE EGA ALTERNATIVE *PC Magazine* took its first look at IBM's Enhanced Graphics Adapter (EGA) over a year ago ("IBM Sets a New Standard," *PC Magazine*, Volume 3 Number 25). Despite some initial reluctance on the part of software manufacturers to support the EGA (probably due to the special treatment that the difference in EGA display and register addressing requires), almost everyone now realizes that this is the board to carry us into the next generation of bit-mapped software.

Very simply, the EGA gives you close to the resolution and readability of IBM's Monochrome Adapter and Display with 16 colors (out of a palette of 64 colors) and high-resolution graphics of 350 lines by 640 dots. The EGA is a versatile adapter that is highly compatible with both the older Monochrome Adapter and the Color/Graphics Adapter.

MONITORS FOR THE EGA Although you can begin enjoying some of the EGA's benefits without investing immediately in a new monitor, to take full advantage of the EGA's high-resolution modes, you'll need IBM's Enhanced Color Display or a compatible.

An EGA-compatible monitor has a split personality because it must run in two different and distinct modes. IBM calls these two modes "TV frequency" (compatible with the regular IBM Color/Graphics Adapter) and "high resolution." These two modes have different horizontal scan rates and treat the direct-drive connector pins in different ways.

In technical terms, here is what constitutes an EGA-compatible color monitor:

First, the monitor must be capable of recognizing and switching between the two horizontal scan rates of 15.75 KHz (the standard television frequency also supported by the regular IBM Color Display) and 21.85 KHz (for the EGA high-resolution modes). The horizontal scan

PC MAGAZINE EDITOR'S CHOICE

The IBM Enhanced Color Display and NEC JC-1401P3A Multisync tie for top honors as best EGA-compatible monitors. For white-against-black and black-against-white text contrast, the NEC is clearly superior, and the NEC also offers a wider range of screen control and compatibility with other adapters. The NEC is also probably the better choice for its excellent text readability and its more advanced adapter use. For color and graphics, go with the IBM. ■

THE REAL PICTURE: MEASURING A MONITOR'S PERFORMANCE

PC Magazine Labs designed two objective tests to overcome human fallibility.

"*Too much red!*" "*Turn down the brightness!*" "*Adjust the contrast!*" When it comes to video display, no two people can agree about what looks right. Which is why we hauled 17 monitors into PC Magazine Labs.

The eye has been the standard optical testing device for roughly 4.3 million years. But when PC Labs needed to establish objective benchmarks for color monitors, the human eye just didn't make the grade. It was too subjective.

Put any number of discerning people in a room with the same monitor and you're likely to find each person embracing a different favorite, or adjusting a shared favorite in a different way—more brightness, less contrast, different color tones—and so it goes.

THE GOAL OF OBJECTIVITY The time had come for scientific instrumentation to take over from the venerable, but subjective, eye. Quantitative testing was, as always, PC Labs' goal. First we *reviewed* each monitor to assess the "human" factors, like how easily you can adjust the display's brightness or if the monitor swivels. We took into consideration the likes and dislikes of subjective users while striving to establish controls and uphold standards. Then we *tested* each monitor by measuring and analyzing physical characteristics like luminance and resolution.

We tested two quantifiable characteristics of color monitors: brightness continuity and character resolution—both good indicators of readability and degree of eyestrain. Tests of these two factors would overcome the biases of those of us who liked or disliked what we saw with our somewhat jaundiced eyes.

We also tried to eliminate any outside factors that could turn the eye of the reviewer. We knew the review process, unlike the tests, would be fraught with subjective traps. So we insisted that all reviewers use standard IBM PC-XTs with either an IBM Color Graphics Adapter or an IBM Enhanced Graphics Adapter. We also compared the performance of an equivalent IBM monitor at each step of the way, to act as a control against which we could compare the others.

To guarantee that the reviewers examined the same factors and applied the same criteria to the monitors, PC Labs wrote a program that enabled reviewers to look at patterns of linearity, color bars, aspect ratio circles, and resolution patterns. Patterns of linearity, in this case grids and dots, accentuated any visual distortion the curvature of the screen may have created. Color bars helped the reviewers evaluate color purity and saturation. The aspect ratio circles helped them judge the visual effect caused by the screen's having different units of height and width. A high-resolution geometric shape that combined lines and spaces varying in size from one to many pixels gave the reviewers a tool for evaluating perceived resolution.

THE TESTS With the review process under control, PC Labs was ready to test two quantifiable characteristics for the benchmarks. First, brightness continuity: We measured the capacity of the monitor to supply the same amount of light intensity, or luminance, throughout the entire screen. We used a Tektronix J16 Digital Photometer equipped with a J6503 luminance probe to measure the amount of luminance at the center and four corners. The photometer measures light in foot-lamberts. (One foot-lambert is equal to one footcandle of light falling on a perfectly diffusing white surface with no loss.) Ideally, a monitor illuminates each of the four corners as intensely as it does the center of the screen.

To eliminate interference from ambient light, we darkened the room com-

Product-testing editor Mike O'Cone measuring luminance with a photometer.

pletely before testing the monitors. The next step was to adjust brightness and contrast controls to bring each monitor to the standard brightness of 10 foot-lamberts, our reference value against which to compare brightness continuity. We measured brightness first at the center, followed by the upper left, the upper right, the lower left, and the lower right corner of each monitor. To obtain the average value, we repeated this sequence three times. After testing all the monitors, we reviewed the results and retested those monitors that showed extreme values to confirm the measurement data.

The bar graphs below show the brightness continuity results for each monitor, with the average luminance designated by the red line across all the bars. The monitors with the best brightness continuity have graphs with bars of similar length. The monitors with less brightness continuity have bars that differ more in length from one another.

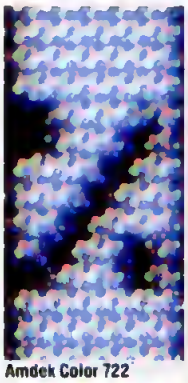
Readability also depends on character resolution. We selected the percent sign (%) as the test for character resolution. Although the naked eye can differentiate between good and poor character resolution, magnifying a character reveals more information. The photographs at right show a percent sign from each of the monitors, magnified by the camera lens. How well the small zeros on either side of the slash are delineated is a good indication of resolution. The slash, since it has both width and height, helps show the aspect ratio.

No two people see things exactly the same way. We all have blind spots and shortsighted views from time to time. PC Magazine Labs' benchmark results, shown here in the bar graphs and photographs, compensate for refracted vision and subjective opinions.

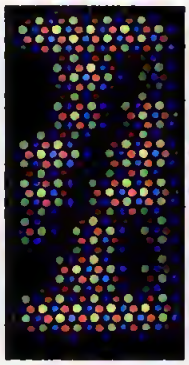
—**Michael O'Cone**

Monitor Quality

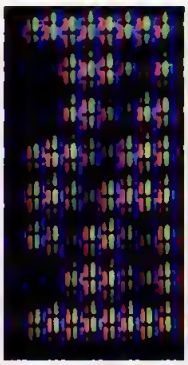
The percent sign (%) was photographed using a Canon TLb 35mm camera with a Componon 1:4/50 lens. All were exposed for 1 second with an aperture of f/4 on Kodak Ektachrome 100 Professional film.



Amdek Color 722



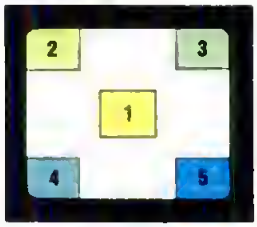
IBM Color Display



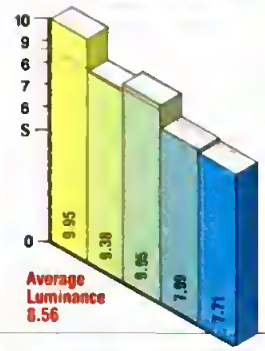
Microvitec 890/DI

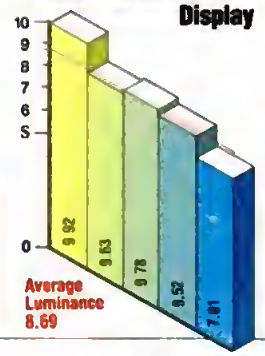
Brightness Continuity

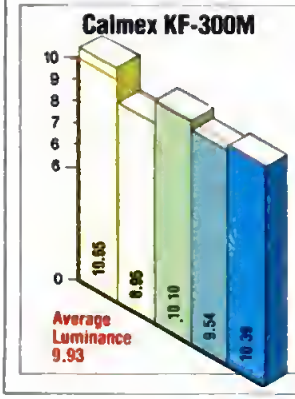
Using a Tektronix J16 Digital Photometer fitted with a Tektronix J6503 Luminance Probe, we tested each monitor for brightness continuity. After adjusting the brightness of the center to 10 foot lamberts, we measured the average brightness of five screen areas (see diagram, right). The results for each area from 1 to 5 are illustrated here (from left to right in each chart). The red line represents the average for all the monitors. The closer the results are to the average, the better that monitor was able to maintain brightness throughout the CRT.

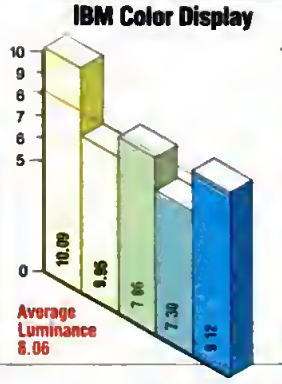


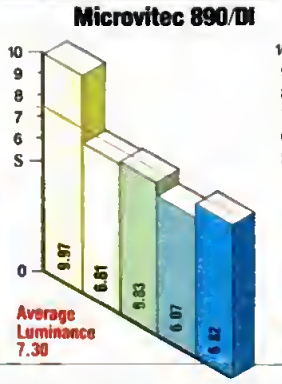
Note: All units are in foot lamberts

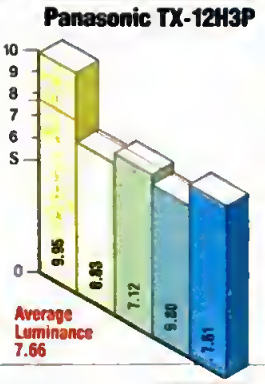


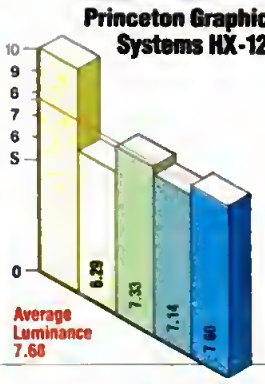


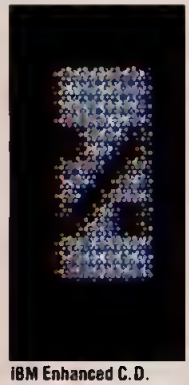




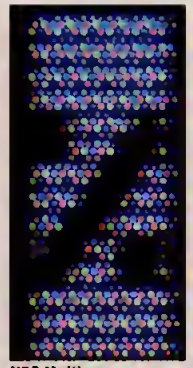








IBM Enhanced C.D.



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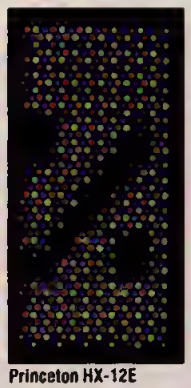
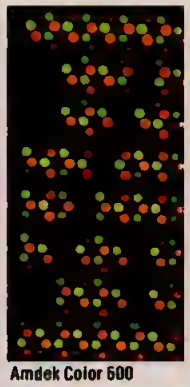
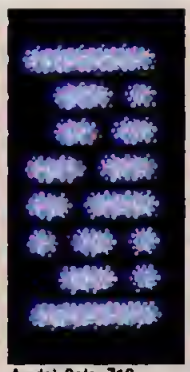


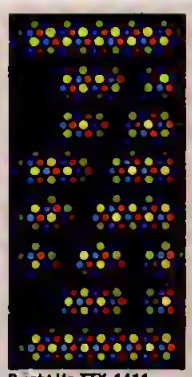
Princeton HX-12E



Amdek Color 600



Amdek Color 710



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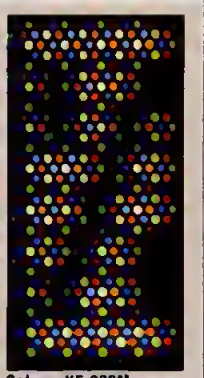

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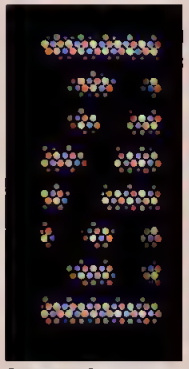

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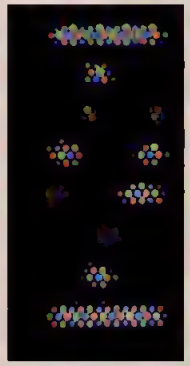
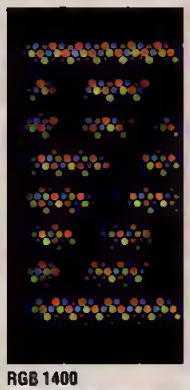
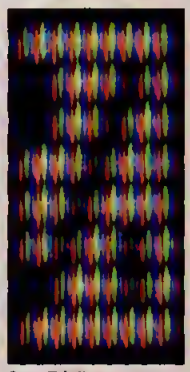


Princeton HX-12

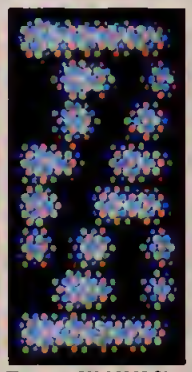


RGB 1400

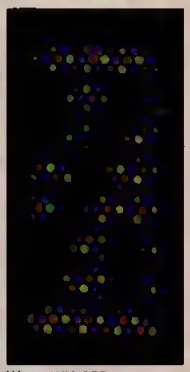
Sakata SC200



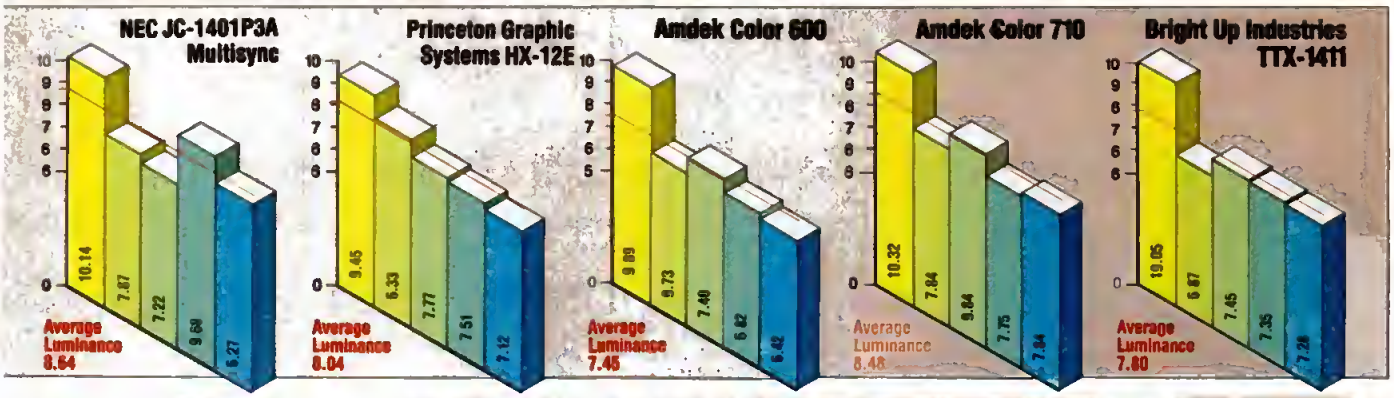
Sony Trinitron

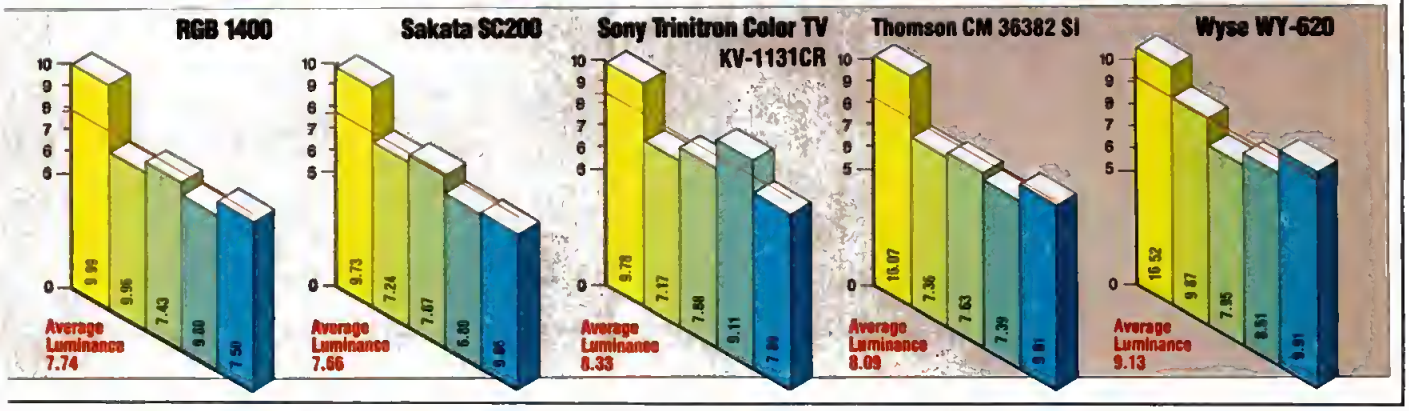


Thomson CM 36382 SI



Wyse WY-620





rate is the number of horizontal scan lines the display can draw per second. If you divide the 60 Hz vertical scan rate (the rate at which the entire screen is refreshed) into each of those numbers, you'll find that the 15.75-KHz rate can handle 200 scan lines and the 21.85-KHz rate can handle 350 scan lines, both with some room to spare. The number of possible scan lines on the display is also called the vertical resolution.

Second, because the time for each scan line is reduced in the 21.85 KHz high-resolution mode, an EGA-compatible monitor video bandwidth must be higher. The video bandwidth is the rate at which the display can draw individual dots. This figure governs the number of dots per line (also called the horizontal resolution). The video bandwidth of the original IBM Color Display is 14 MHz, but a display for the EGA must also handle a video bandwidth of over 16 MHz.

Finally, an EGA-compatible monitor must support the display of 16 colors in the 15.75-KHz mode and 64 colors in the 21.85-KHz mode..The IBM Color/Graphics Adapter uses four of the nine pins on the direct-drive connector for color: red, green, blue, and intensity. Combinations of these four signals create up to 16 colors on the display. The Enhanced Graphics Adapter can mimic this output for the 15.75 KHz/200-line modes but also redefines some signals on the connector for the 21.85 KHz/350-line modes. In these latter modes, the EGA puts out two sets of red, green, and blue signals (called primary and secondary), for a total of 64 possible colors. Owing to the structure of the Enhanced Graphics Adapter itself, however, only 16 of these 64 colors can be displayed at any one time.

The IBM Enhanced Color Display and the three compatible monitors reviewed in the pages that follow all meet these requirements, but they do so with varying degrees of design savvy and color and image clarity. These reviews, along with the feature comparison table, should help you decide which one meets your requirements for prize performance.

IBM ENHANCED COLOR DISPLAY

The IBM Enhanced Color Display looks very much like IBM's other monitors for the PC and, with its three knobs on the front, almost exactly like the IBM Color Display. Only the metal label above the knobs gives away its secret.

Power, contrast, and brightness are controlled from the front. The contrast control is particularly unusual. When pushed in, the contrast is at a preset unchangeable level. To change the contrast, you pull out the knob. Turning the contrast all the way to the left makes the bright colors look the same as the dark colors. (It does this by attenuating the intensity level of the RGB signals in the 200-line mode and by attenuating the secondary RGB signals in the 350-line mode.)

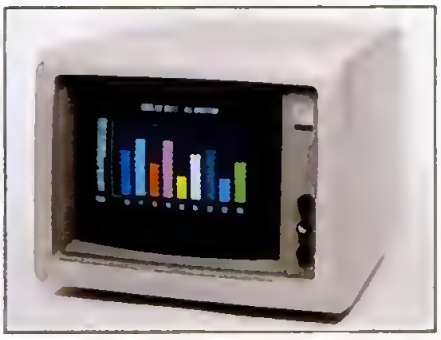
On the Enhanced Color Display tested by PC Magazine Labs, the preset contrast gave the best possible brown. Brown is

PC MAGAZINE FACT FILE

Enhanced Color Display
IBM Corp.
1000 NW 51st St.
Boca Raton, FL 33432
(800) 447-4700
List Price: $849
Requires: Enhanced Graphics Adapter.
In Short: The IBM Enhanced Color Display generates good text (although not as good as that of the NEC JC-1401P3A Multisync) and graphics. Its contrast control is well implemented.

CIRCLE 671 ON READER SERVICE CARD

On the outside, the Enhanced Color Display closely resembles IBM's other monitors. Its front control panel has the same knobs as the original Color Display: power on, brightness, and contrast. Put some text on screen, though, and you'll see the difference: This display is much more readable, especially if the contrast and brightness controls are carefully set. The Enhanced Color Display's colors are very good as well, particularly the bright colors.



Photographs: Les Marsillo

THE EGA BOARD

IBM's EGA is versatile enough to work with IBM's monochrome and ordinary color monitors as well as with the new Enhanced Color Display.

IBM's Enhanced Graphics Adapter, because it is highly compatible with the older Monochrome Adapter and Color/Graphics Adapter, is at once both very versatile and somewhat confusing. What you can do with the EGA depends on the amount of memory installed on the board and the type of color monitor you connect to it.

ASSEMBLING THE PIECES The Enhanced Graphics Adapter ($524) comes with 64K bytes of memory already installed on the card. With this memory you can use all of the character and graphics modes available, but the highest-resolution graphics mode (350 lines down by 640 dots across) is limited to 4 colors instead of 16.

The Graphics Memory Expansion Card ($199) comes with another 64K of memory and piggybacks on the main board for a total of 128K. The board still takes up only one slot. This extra memory allows the adapter to display all 16 colors in the highest-resolution graphics mode. When using text modes, you can also upload an additional character set for a total of 512 displayable characters. For most normal uses of the EGA, 128K bytes is sufficient.

The Graphics Memory Module Kit ($259) contains 128K bytes of chips that plug into empty sockets on the Memory Expansion Card for a total of 256K. This is the maximum memory the adapter can hold. Programs can use the extra memory for multiple video pages.

If you will be using the card with the IBM Monochrome or IBM Color Display, you will probably only need the 64K on the main board unless you want to try out the 512-character set with 128K. If you also get the Enhanced Graphics Display, you'll probably want to increase memory to 128K with the Graphics Memory Expansion Card. You reap no advantage from going beyond 128K unless you have a specialized application that requires the extra video pages.

WRESTLING WITH HERCULES When attached to the IBM Monochrome Display, the Enhanced Graphics Adapter can emulate the operation of the IBM Monochrome Adapter for the 25-line by 80-character display. (IBM calls this "video mode 7".) The display address is the same, and most of the registers function similarly. Most programs that run on the Monochrome Adapter should run on the EGA/Monochrome Display combination with no problems. However, some of the attributes (high intensity, underlining, and reverse video) are different, so programs that use the same attributes for monochrome and color may not look the same.

■ Most programs that run on the Monochrome Adapter should run on the EGA/Monochrome Display combination with no problems.

Under this mode, the EGA can offer eight video pages instead of the one available with the normal Monochrome Adapter. By increasing memory to 128K bytes, you can upload another font to create a set of 512 characters. Even with 64K, the normal font is replaceable by software. Programs may also switch into a 43-line text mode using an 8 by 8 character box.

When attached to the Monochrome Display, the EGA can also be set to video mode 15, unique to the EGA. This 350-line by 640-dot graphics mode has four "colors" (black, normal, high intensity, and blinking) and is *not* compatible with the Hercules monochrome graphics mode. However, you will find that most programs that specifically support the high-resolution modes of EGA will also support this monochrome graphics mode. The few programs I tried out that worked on the EGA/Monochrome Display combination are *Microsoft Word; Microsoft Windows;* Digital Research's *GEM Desktop; 1-2-3*, Release 2; and Lotus's new EGA drivers for *1-2-3*, Release 1A. Bringing the EGA up to 128K bytes of memory adds another video page in this graphics mode.

SAME DISPLAY, DIFFERENT ADAPTER When attached to the regular IBM Color Display (or compatible monitor), the EGA can emulate all modes of the Color/Graphics Adapter (CGA): the 40-character text modes 0 and 1, the 80-character text modes 2 and 3, the 200 by 320 four-color graphics modes 4 and 5, and the 200 by 640 two-color graphics mode 6. However, the EGA has only a direct-drive RGB output and does not duplicate the composite video output of the CGA.

Most programs that use CGA graphics will run on the EGA, but software that attempts to directly program the 6845 chip on the CGA may have some problems. The most notorious example is the original graphics driver with *1-2-3*, Release 1A. (Lotus has recently brought out new drivers for the EGA.) Games that do extensive adapter programming, such as Microsoft's *Flight Simulator*, will not run at all.

The EGA also has two new graphics modes that can run on the IBM Color Display. Mode 13 displays 200 lines of

(continued)

faked on the EGA in the enhanced mode by combining a dark green and a bright red, and so the proper contrast setting is important. (However, on other Enhanced Color Displays I've seen, the preset contrast does not give a good brown. Perhaps a control to adjust the setting for the preset contrast would be a help. This would essentially give you two contrast ranges selectable by pulling out or pushing in the contrast knob.)

You can change vertical size (the height of the display area) with one of two knobs in the back, depending on the horizontal scan rate the monitor is using. On some Enhanced Graphics Displays, the display area is slightly off center, but there is no way to correct that problem.

For overall clarity, color, and display stability, the IBM was nearly the best of the displays for the EGA that PC Labs tested. On some other monitors, a light full-screen background will bounce in size as the brightness control is quickly turned up and down. On the IBM display, this bounce was negligible. The display generally recovered from a mode change very quickly without the type of screen flipping you often see on the IBM Color Display. (Again, however, I've seen other IBM Enhanced Graphics Displays that rolled a bit when the mode was changed.)

The distinct effects of the brightness and contrast controls help you set the display for clear and readable text. Even in the 43-line EGA mode using an 8 by 8 character box, text is more readable than it is on the old Color Display using the same 8 by 8 font. The contrast is good in 350-line modes and about the same as the Color Display's for 200-line modes. The 350-line modes' contrast only look deficient when compared side by side with the NEC JC-1401P3A Multisync, also reviewed here. Even with the brightness turned up all the way, the black background stays black.

In a colorbar display, the bright colors have a pastel glow that makes programs that use color extensively (like *Microsoft Windows*) look very pretty.

Overall, the IBM Enhanced Color Display is a fine companion to the IBM Enhanced Graphics Adapter. Of course, as with most of IBM's products, the price is really the only significant problem.

("The EGA Board" continued)

320 dots with 16 colors. Two video pages are available with 64K, four with 128K, and eight with 256K. Mode 14 displays 200 lines of 640 dots, also with 16 colors but half the number of video pages. The programs I mentioned above that specifically support the EGA will use mode 14 if the EGA is attached to a Color Display.

THE INEVITABLE STEP UP You'll eventually want to match the EGA to an Enhanced Color Display or compatible. It can do everything the EGA/Color Display combination can do and more. Because the Enhanced Display is capable of 350-line vertical resolution, the EGA displays existing text modes (0 through 3) with an 8 by 14 character box instead of the 8 by 8 character box. Thus, existing software that uses text modes will suddenly be a lot more readable on the EGA. Programs can also upload their own character fonts to the board in text mode.

If you don't mind an 8 by 8 character box, with a little effort and programming you can use the increased resolution to display 43 lines of text instead of the normal 25 lines. So far, I've seen this accomplished only with that masterpiece of malleable programming, *WordStar* (see Power User, Volume 4 Number 25). You can use PC-DOS in a 43-line text mode, but not if you have ANSI.SYS loaded.

Adding an Enhanced Color Display also makes available the EGA's highest-resolution graphics mode: 350 lines by 640 dots (mode 16). This is the mode that gives you nearly the resolution of the monochrome display with color and graphics. However, with the standard 64K on the board, you can only get 4 colors in this mode. If you have a 64K EGA with an Enhanced Color Display, programs such as *Microsoft Word* and *Microsoft Windows* will use mode 14, which has a lower resolution but the full 16 colors.

Adding the Memory Expansion Board to increase the total memory to 128K lets you use 16 colors in mode 16, and *Word* and *Windows* will then use it. Adding another 128K gives you a second video page.

STAY TUNED The EGA also contains a light pen interface (compatible with the one on the CGA) and a 32-pin connector referred to in the IBM documentation only as a "feature connector."

What feature is that? you may ask. Through the feature connector, an external device has access to the color and sync output of the EGA, the 2 video jacks on the back of the adapter (which serve no other purpose), and some internal register settings. The EGA can also be programmed to use the clock and sync signals from the external device instead of its own. In short, since the feature does not yet exist, it is limited only by your imagination.

THE NEXT-HIGHER STEP The Enhanced Graphics Adapter is not IBM's only high-resolution alternative to the Monochrome and Color/Graphics Adapters. About the same time it introduced the EGA, IBM also unveiled the Professional Graphics Controller (PGC) and Professional Graphics Display. This team offers the same horizontal resolution as the EGA does (640 dots) but increases the vertical resolution from 350 lines to 480 lines. An on-board 8088 microprocessor commands 320K bytes of memory for 256 colors out of a palette of 4,096.

With built-in pixel-crunching software, the PGC is best suited for graphic art, image processing, and engineering applications such as computer-aided design (CAD). Like the EGA, the PGC can emulate the Color/Graphics Adapter video modes. It uses two slots in an XT, AT, or expansion chassis (not a regular PC) and draws 5 amps of power.

For most business applications the PGC is overkill, but for potential EGA buyers, it serves a very important function: Since the Professional Graphics Controller costs $2,995 and the Professional Graphics Display costs $1,295, the PGC helps convince you that the EGA is a bargain.—**Charles Petzold**

AMDEK COLOR 722

Like Amdek's monitors for the IBM Color/Graphics Adapter, the Color 722 for the EGA has its brightness and contrast controls located on the bottom of the front panel. Also on the bottom of the case is a "text" that lets you substitute either a green or amber monochrome for color. While this substitution sometimes improves the readability of text modes that use 200 scan lines, it is less useful with the EGA's 350-scan-line text mode. You can adjust vertical size, vertical hold, and horizontal phase from the rear of the case using a small screwdriver.

Amdek's contrast and brightness controls do not function like those on the IBM display. While the IBM contrast changes the difference between light and dark colors, the Amdek contrast control seems to function as a secondary brightness control. Fortunately, the Color 722 preserved the same acceptable brown over all settings of brightness and contrast. But unlike the IBM display, the Amdek display did not retain a black background when the brightness control was turned up high.

When compared with the IBM display, the Amdek shows a mixed bag of readability and color. One test that displayed single-pixel-wide lines of different colors side by side showed a sharper contrast on the Amdek than on the IBM. A spectrum test programmed in *Microsoft Windows* showed a wider spectrum of colors on the Amdek monitor and better grays. But in the enhanced modes colorbar test, the Amdek could not match the vibrant pastels of the light green and light cyan colors on IBM's monitor. Amdek's white-on-black text also had a reddish tinge to it.

In the factory setting for vertical size, the aspect ratio of the Color 722's display area was slightly narrower than that of the IBM. This difference may mean that round circles and square boxes programmed for the EGA may not appear entirely round or square, so you may have to change the vertical size with a small screwdriver to compensate.

The Amdek Color 722's readability and color are certainly acceptable alternatives to those of the IBM display. However, the Amdek has a fundamental design difference that I found disturbing.

When switching between the 200-line and 350-line video modes, the Color 722 emits an audible thunk, the display area shrinks, you see some screen static, and then the display quickly swells back to normal. It is certainly not as clean a mode switch as the IBM Enhanced Color Display can manage. Amdek's engineers told me that this disturbance was due to a mechanical relay used in the monitors to switch between the two horizontal sync rates. They said that people liked to know when the video mode was changed (somewhat like the printer reset that tells you that you're running a compiled BASIC program, I guess).

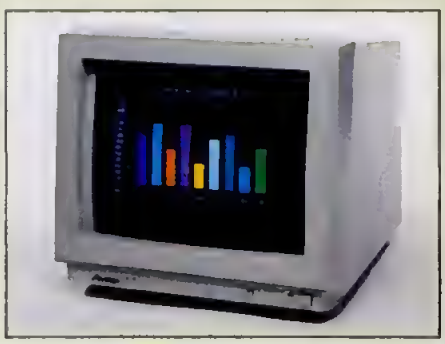
Not all users will appreciate this deliberate design quirk—and I'm one of the ones who doesn't. I particularly don't like the idea of a mechanical relay doing the job *[although Compaq's Portable has had a relay from the start.—Ed.]*.

PC MAGAZINE FACT FILE

Color 722
Amdek Corp.
2201 Lively Blvd.
Elk Grove Village, IL 60007
(312) 364-1180
List Price: $799
Requires: Enhanced Graphics Adapter.
In Short: The Amdek Color 722 delivers about the same overall quality as the IBM Enhanced Color Display. Its contrast is somewhat better, but its colors are not as good. Its mode-switch design is poor.

CIRCLE 669 ON READER SERVICE CARD

Along with the usual brightness and contrast controls (which Amdek has placed at the bottom of the front panel), the Color 722 boasts a text switch that lets you edit text in green or amber monochrome. In the color mode, text is not as crisp and readable as on the IBM Enhanced Color Display and the colors are not as vibrant. A narrow aspect ratio may result in slightly distorted geometric shapes, but you can fix them by adjusting the vertical size control.



EGA-Compatible Monitors: Summary of Features

Manufacturer	Model	List price	Screen size (measured diagonally in inches)	Resolution (horizontal dots × vertical lines)	Number of colors	Bandwidth (MHz)	Dot pitch (mm)	Horizontal frequency (KHz)	Vertical frequency (Hz)
Amdek Corp.	Color 722	$799	13	720 × 240 (15.75 KHz) 720 × 350 (21.85 KHz)	64 (21.85 KHz EGA) 16 (15.7 KHz EGA or CGA)	18	0.31	15.7 & 21.85	60
IBM Corp.	Enhanced Color Display	$849	13	640 × 200 (15.75 KHz) 640 × 350 (21.85 KHz)	64 (21.85 KHz) 16 (15.75 KHz)	16	0.31	15.75 & 21.85	60
NEC Home Electronics (USA) Inc. Personal Computer Division	JC-1401P3A Multisync	$799	13	800 × 560	64 (21.85 KHz) 16 (15.75 KHz) Unlimited (analog input)	20	0.31	15.75–35	50–62
Princeton Graphic Systems	HX-12E	$785	12	770 × 200 (15.75 KHz) 770 × 350 (21.85 KHz)	64 (21.85 KHz) 16 (15.75 KHz)	20	0.28	15.75 & 21.85	60

Editor's Choice products appear in red

PRINCETON GRAPHIC SYSTEMS HX-12E

The Princeton Graphic Systems HX-12E's case is styled very much like that of the IBM monitor, but the viewing screen is smaller than the IBM Enhanced Color Display's and those of the other EGA-compatible monitors that PC Labs examined. The specifications claimed a 12-inch diagonal, but my ruler said 11½ inches. This discrepancy is not in itself a problem: The proportions of the screen are about the same as those of the IBM, and you can fine-tune the vertical size using a small screwdriver from the back.

The front of the monitor has just two knobs. The first is a power pull-on switch combined with the contrast control. This combination will confuse people accustomed to the IBM monitor. I had a tendency to push in the contrast control (which returns to the preset contrast on the IBM) and inadvertently turn the monitor off.

The brightness control must be set almost at maximum. Anything lower than about three-quarters of full setting plunges the screen into black. A proper setting of the horizontal-hold control is also critical, particularly for the 640 by 350 resolution mode. If it's off slightly, you'll lose some of the screen at the sides.

The HX-12E's colors are very bright, but in the EGA 350 by 640 graphics mode, I had a difficult time adjusting brightness and contrast for decent browns and yellows, in part because of a different implementation of the two controls. On the IBM, the contrast control affects only the intensity signal (in the RGB modes) and the secondary bright-color signals (in the enhanced modes). On the Princeton, the contrast affects the dark colors.

This difference may create a problem in programs using low-intensity and high-intensity text. The adjustment that produced the best readability of low-intensity characters made the high-intensity characters too bright and mushy. In my favorite color combination for text (bright yellow on blue), the letters had a reddish tint.

On the colorbar test, the bright white and yellow bars (at the lower right of the screen) developed faint violet splotches after a few seconds. The 350-line modes tended to show considerable bouncing of the screen image as I adjusted the contrast and brightness controls, and the left and right sides curved inward slightly.

In comparison to IBM's Enhanced Color Display, I could find no real advantages to the Princeton Graphic Systems HX-12E that offset its deficiencies. I can recommend this monitor only if you can get a really good price on it.

PC MAGAZINE FACT FILE

HX-12E
Princeton Graphic Systems
170 Wall St
Princeton, NJ 08540
(609) 683-1660
List Price: $785
Requires: Enhanced Graphics Adapter.
In Short: The HX-12E is a good monitor, but not a great one. It is difficult to adjust its contrast settings to get good color. White and yellow are problematic.

CIRCLE 660 ON READER SERVICE CARD

NEC JC-1401P3A MULTISYNC

While I will never remember the model number of the NEC JC-1401P3A Multisync color monitor, this display's features and quality are truly memorable.

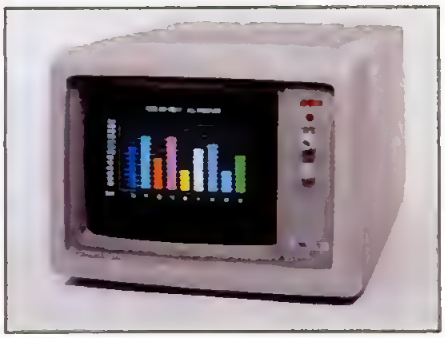
The Multisync is a versatile monitor

that can be used not only with the IBM Color Graphics Adapter and Enhanced Graphics Adapter, but also with the IBM Professional Graphics Controller and with many non-IBM adapters. PC Magazine Labs did not have the opportunity to test it with the Professional Graphics Controller, but if you're looking for a display that can go beyond the EGA when you're ready to, this is certainly one to consider seriously.

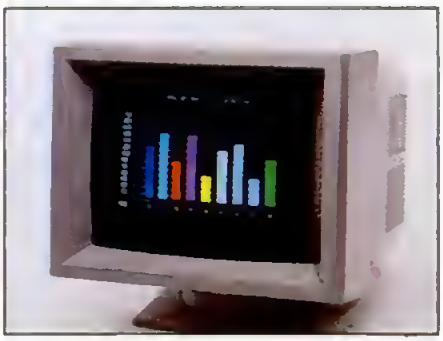
The NEC monitor has the sleekest design of all the EGA-compatible monitors we examined and was the only one that came with a swivel base. The front of the unit is unmarred by controls; instead, the major controls are on the top of the display hidden by a flip-up cover marked with legends. These are certainly not as convenient as front-panel controls, but I really appreciated the greater selection, including horizontal and vertical size and position, and a "text" switch to kill color.

Unfortunately, the main on/off switch is way in the back. You can easily find it with a minimum of groping, but you may want to use some other means (such as an outlet box) to turn the monitor on and off.

The Princeton Graphic Systems HX-12E has a slightly smaller screen than its competitors, but the proportions of its images remain true. Contrast and brightness controls are located on the front of the monitor, but it is difficult to find a setting that works well both for bright and dark colors and for high- and low-intensity text. When low-intensity characters are most readable, high-intensity ones become mushy. Several colors tend to develop violet splotches.



The sleekly designed NEC JC-1401P3A Multisync sits on a swivel base, with no controls in sight. The brightness and contrast adjustments, along with horizontal and vertical controls and a monochrome switch for text, are located on top, under a flip-up cover. The Multisync is a superb performer, with excellent color and resolution and crisp text that is particularly readable in black and white. The top of the display bows slightly outward.



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CIRCLE 204 ON READER SERVICE CARD

THE EGA STANDARD

The back of the case has a set of DIP switches, which is unusual for a monitor. Although the factory settings use white for text mode, the DIP switch allows any combination of red, green, and blue. You can also use the DIP switches to explicitly specify that the input line signals carry 8, 16, or 64 colors. A rear toggle switch specifies TTL or analog. The CGA and EGA use TTL signals; the Professional Graphics Controller uses analog signals for (theoretically) unlimited colors.

The monitor can automatically adjust to horizontal sync rates between 15.5 KHz and 35 KHz. As with all EGA-compatible monitors, it can adjust for the proper color signals when it detects the EGA 15.75- and 21.85-KHz rates. For other sync rates, you'll have to set the DIP switches for 8, 16, or 64 color signals. What is really amazing, though, is that if you disconnect this display from an EGA and connect it to IBM's Professional Graphics Controller, you only need throw the TTL/analog toggle switch, and the display does the rest.

The Multisync's features are surpassed only by its performance; its color and resolution are generally excellent. One advantage in particular over the IBM is a markedly sharper white-on-black and black-on-white contrast in all video modes, which makes text look very crisp.

The only problem I had with the NEC display was a bowing outwards of the very top of the display area, and I could readily see some of the upper scan lines in 350-line mode. But in its quality and versatility, this monitor is a real winner. ■

PC MAGAZINE FACT FILE

JC-1401P3A Multisync
NEC Home Electronics (USA) Inc.
Personal Computer Division
1401 Estes Ave.
Elk Grove Village, IL 60007
(312) 228-5900
Requires: Enhanced Graphics Adapter or Professional Graphics Controller.
List Price: $799
In Short: The NEC Multisync is a sleek and versatile monitor with lots of controls (not all of them convenient). Its text contrast is excellent and its color very good.

CIRCLE 670 ON READER SERVICE CARD

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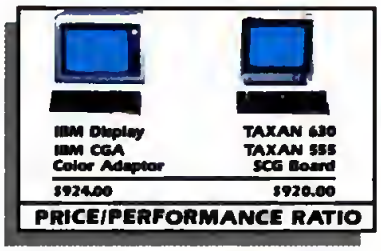

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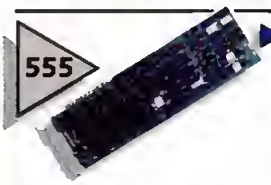

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320 X 200	4 Colors	4 Colors
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Alphanumeric Text Resolution		
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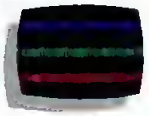
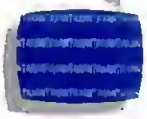

RGB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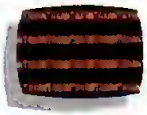
REVERSE B & W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CIRCLE 485 ON READER SERVICE CARD

The IBM Color/Graphics Adapter has made the digital RGB monitor the standard for color graphics. Here are thirteen RGBs to make your daily routine more colorful.

COLOR MONITORS: CHALLENGING THE IBM STANDARD

With all the attention higher and higher resolution graphics systems have been attracting lately, you might wonder why you should consider anything else. But despite the quantum leap PC graphics capabilities have taken since IBM introduced its Enhanced Graphics System last year, standard-resolution color displays are alive and well and will likely be the predominant standard for quite some time.

When *PC Magazine* surveyed color monitors 3 years ago, PC users were just beginning to perceive them as more than mere luxury items or toys for playing games. Business software was beginning to make good use of color and graphics, a trend that has continued unabated. Color monitors are now fixtures on many PC users' desks, and they do more than just make business software look more interesting. Today's PC screens are often as cluttered as our desktops, and color helps sort out the elements. More than that, people who spend large chunks of the day glued to a PC screen often find that color helps them work more efficiently.

For this survey, we narrowed our focus to one particular group of color monitors, those that are compatible with IBM's original Color/Graphics Adapter. We standardized our procedures by using the same graphics card with all of the monitors we tested: the genuine IBM Color/Graphics Adapter.—**Jim Forney**

Photographs: Les Morsillo

PC MAGAZINE EDITOR'S CHOICE

Wyse's WY-620 color monitor displayed enough character to shine brightly above the crowd. Its overall display is so crisp you might think you're looking at an EGA-compatible monitor. The WY-620 is also one of two monitors whose guns shoot a relatively steady stream of light (see benchmark results), and its clearly defined pixels form a tight pattern with little to no wasted area between (see photo). The only drawback is the lack of an internal power supply, but if your system has sufficient power—and most IBM XTs do—then there is no reason not to purchase this color display.

*For the technically or artistically inclined user, **RGB Display Corp.'s 1400** is a dream come true. Its extra palette of colors, multitude of controls, and legible text make it ideal for specialized markets. While its pixels do not have the tightest pattern of the monitors tested, they are very well formed, and with the separate controls, you can produce your own level of color purity.* ■

AMDEK COLOR 600

Amdek's Color 600 is a popular monitor for good reasons. It is a good performer, offering more control over the screen than most without overwhelming the user.

The aspect ratio on the test unit was nearly perfect, requiring no touch-up at all, although the Color 600 does have an accessible height control for real perfectionists. Its resolution is good, with no tendency to mushiness in fine-detail areas. Linearity is good; dots don't spread and separate into colors even in the corners.

The Color 600 has a full-function contrast control as well as a brightness control. You can obtain a good clean gray without desaturating the yellow test bar—something not all monitors can do. In fact, all 16 colors look pretty good on the Color 600, including brown, a color some monitors have trouble producing. Still, the screen lacks an abstract quality I would call sparkle or brilliance. Alongside an IBM Color Display, its colors looked slightly dull.

One of the Color 600's useful features is switch-selectable monochrome text in either green or amber. These monochrome settings will not give you the kind of text resolution that most straight monochrome monitors are capable of, but both are easier on the eyes than white on black and require no programming or software support. In the monochrome modes, the Color 600 displays eight shades, from black to bright.

The Color 600's controls are well placed and not intimidating to the casual user. Like some of the once-a-year-type knobs on the back of a TV set, the more esoteric ones are recessed to prevent you from accidentally hitting them.

A few complaints: The high-voltage regulation is not as good as on some of the Color 600's competitors; some defocusing occurs at higher brightness settings. And the cable that connects the Color 600 to your PC falls short—in fact, it will fall off if you don't secure the screws.

But the Amdek Color 600 is a monitor you should look at. It doesn't attempt anything fancy, but the things it does well, it does very well.—**Jim Forney**

PC MAGAZINE FACT FILE

Color 600
Amdek Corp.
2201 Lively Blvd.
Elk Grove Village, IL 60007
(312) 364-1180
List Price: $599
Requires: Color/graphics card.
In Short: The Amdek Color 600 displays a somewhat coarse image owing to its 0.43 dot pitch. The user controls are adequate and well placed.

CIRCLE 682 ON READER SERVICE CARD

AMDEK COLOR 710

If you would like to upgrade to an RGB monitor but find the resolution inadequate when working with text files, Amdek's 710 may solve your problems. Priced at $699, the Color 710 is Amdek's top-of-the-line RGB monitor. Its front-panel controls include a TXT button that allows you to select any of three additional modes: green, amber, or an intensity-differentiated display.

The Color 710 comes with a standard video cable and an overlarge A/C power plug. The brightness, contrast, text, and power controls on the front of the monitor are easily accessible. Unfortunately, the same cannot be said for the V-size, V-hold, and H-phase controls in the back. Rather than knobs, these are slits so little that you would have trouble slipping a piece of paper into them, much less a screwdriver.

PC Magazine Labs' benchmarks proved the Color 710 is an acceptable but not noteworthy altemative to the IBM Color Display. Benchmark tests indicated that the monitor suffers some misconvergence and distortion. Virtually all of the problems, though, are correctable by adjusting the front-panel controls.

If the Amdek Color 710 has a major fault, it lies in its handling of image persistence. When you run *WordStar* on a Color 710, certain images, such as deletions and the blinking cursor, tend to linger on-

PC MAGAZINE FACT FILE

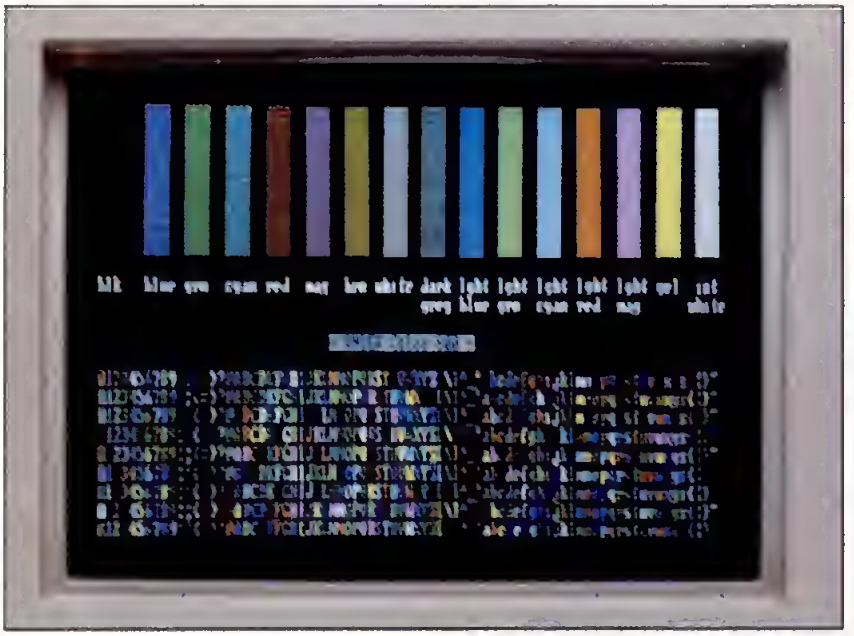
Color 710
Amdek Corp.
2201 Lively Blvd.
Elk Grove Village, IL 60007
(312) 364-1180
List Price: $699
Requires: Color/graphics card (card with interlace recommended).
In Short: Amdek's Color 710 has more capabilities than the IBM Color Display, including a three-mode text display button. However, its white is muddier and tends to shift to brown when deleting text in some programs.

CIRCLE 681 ON READER SERVICE CARD

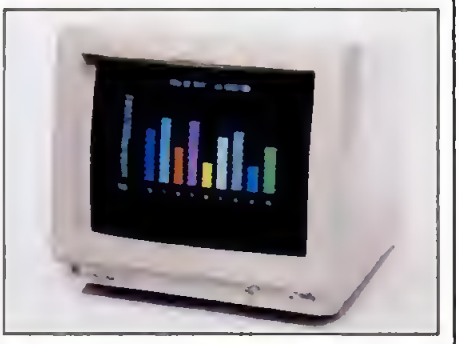
screen and shift from white to brown before disappearing completely. (My Amdek 600 has the same problem; the browning effect is easily ignored during text processing.)

Certain colors on the Color 710, such as the green and blue, are deeper than those on the IBM Color Display; others, especially the black and the white, are muddier. This muddiness, combined with the browning effect during image refreshing, produces a less-than-crisp contrast. Another result of the muddiness is that gray text tends to bleed into a white background. Other than the gray-on-white combination, legibility is good for all colors and intensities. For example, yellow text on a brown background, a combination that is difficult to read on most monitors, is extremely readable with no visible color shift during a refresh.

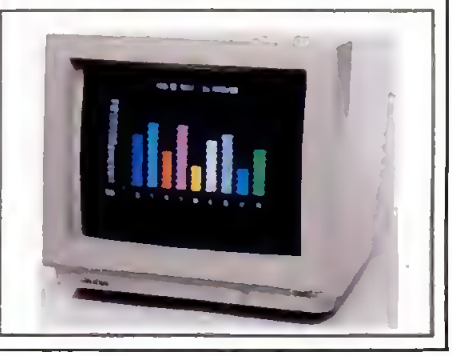
While text is legible in the color mode, the text button produces a more readable display. The green and the amber monochrome modes differentiate between high and normal intensity, so you do not lose any of the benefits of highlighted text. If



The Amdek Color 600 offers a full-function contrast control as well as a brightness control. Its aspect ratio required no touchup, although the display does comes with an accessible heighu control. The Color 600's resolution has a tendency toward mushiness in fine-detail areas; however, linearity is good—dots don't spread and separate into colors even in the corners. The monitor also features switch-selectable monochrome text in either green or amber.



The Color 710, Amdek's top-of-the-line model, suffers from some misconvergence and distortion. However, these problems can be corrected by adjusting the brightness, contrast, text, and power controls located on the front of the monitor. The text button, for switching into monochrome mode, is also on the front panel. The V-size, V-hold, and H-phase controls, which are found in the back, consist of small slits that are almost impossible to adjust.



you require more differentiation, you can use the text button's third mode. It differentiates between the colors by intensity, creating, in essence, a 16-shade green scale. The overall effect is much like that produced by the Hercules card on a monochrome monitor.

The Amdek Color 710 may not be the best CGA-compatible RGB monitor, but it is a reasonable stand-in for the IBM Color Display, especially if you process a lot of text and only reproduce graphics in tones rather than colors.—**Vincent Puglia**

BRIGHT UP INDUSTRIES TTX-1411

Not exactly a household word, Bright Up Industries is marketing a standard RGB monitor that is excellent in some respects but comes up just a little short in others.

The TTX-1411 has more user controls than some of its competitors. The most useful ones are the most accessible, and those less frequently used are out of the way on the back. Up front, the TTX-1411 has brightness, contrast, and vertical hold in addition to the power switch. On the back, you have access to vertical linearity, vertical size, horizontal hold, and horizontal phase (side-to-side shift).

The test unit's colors were all quite good with the exception of yellow, which looked a little greenish, and gray, which dropped off to black unless the brightness control was turned up pretty far. Brightness and contrast turned out to be TTX-1411's Achilles' heels. Neither control gives you an adequate range. The contrast control works quite differently from that of its competitors; it seems to subtract brightness rather than alter contrast, and it is during this subtraction process that the gray vanishes.

High-voltage regulation seems exceptionally good, with almost no change in screen image size when you go from normal to bright text. Image resolution is also good, and color convergence is nearly perfect, deviating by no more than ½ dot width in one extreme corner. Linearity is well within acceptable limits, although not as good as on the IBM Color Display.

As received, the unit's aspect ratio was slightly off, but this is easily adjustable. Overall, except for contrast and brightness, Bright Up's TTX-1411 gets high marks, and even in those areas, its shortcomings are not serious.—**Jim Forney**

PC MAGAZINE FACT FILE

TTX-1411
Bright Up Industries Inc.
TTX Group
366 Paseo Sonrisa
Walnut, CA 91789
(714) 595-6146
List Price: $579
Requires: Color/graphics card.
In Short: The TTX-1141 from Bright Up's new TTX group provides useful and well-placed controls. Its colors are good, except for a greenish yellow. A monochrome text mode helps to balance out poor contrast in color.

CIRCLE 680 ON READER SERVICE CARD

CALMEX KF-300M

Priced at $559.95, Calmex's KF-300M Multi-Display Color Monitor is a more than reasonable buy for the cost-conscious. It offers virtually the same capabilities as the IBM Color Display plus a mode-selector knob to switch from full color to green or amber. However, there are problems with the overall design.

As on most monitors, the front panel sports easily accessible brightness, contrast, and mode controls. The mode selector knob has a frustrating tendency to stick between modes. The rear panel features the vertical-hold and vertical-size knobs. The latter control, which enables you to achieve whatever horizontal/vertical ratio you wish, is useful for ensuring perfectly rounded pie charts.

Colors on the KF-300M are on a par with those of the IBM Color Display. Although text is legible in the color mode, a few foreground/background combinations produce some illegibility. For example, a full screen of white text on a black background has a tendency to slant. The combinations of gray on black and yellow on brown are difficult to read, especially if the area in question is blinking or the screen is being updated. In both cases, the colors tend to shift and bleed into each other. Adjusting the contrast helps only somewhat.

For these reasons, most users would probably prefer the monochrome modes when working with text files. The KF-300M's text modes display only one intensity, however, so while you gain overall legibility, you lose the effect of highlighted text. However, if you leave the mode selector between modes, you can produce a three-color palette that may or may not be desirable, depending upon your software.

> ■ IBM's approach seems to be, turn it on and forget it exists. To a large extent you can.

As it did for some other monitors reviewed here, our grid line test of the KF-300M indicated that it is prone to distort its vertical lines. Fortunately, you can easily correct the alignment by turning the brightness down and the contrast up.

The KF-300M demonstrates the same relative resolution as the IBM Color Display; that is, there is some minor misconvergence in the corners. For the vast majority of applications, this deficiency should not be a factor.

PC MAGAZINE FACT FILE

KF-300M Multi-Display Color Monitor
Calmex Inc.
1321 Virginia Ave.
Baldwin Park, CA 91706
(818) 338-8001
List Price: $559.95
Requires: Color/graphics card.
In Short: Calmex's KF-300M has easily accessible user controls, including a mode selector that switches from color to monochrome. Poor heat dissipation may affect reliability.

CIRCLE 679 ON READER SERVICE CARD

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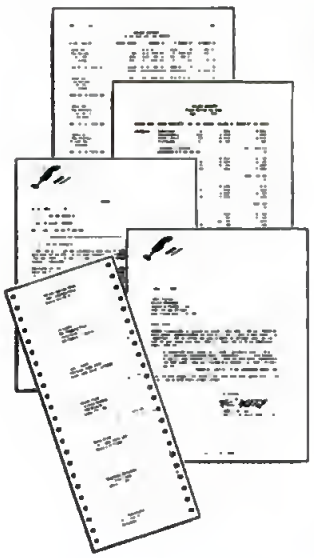

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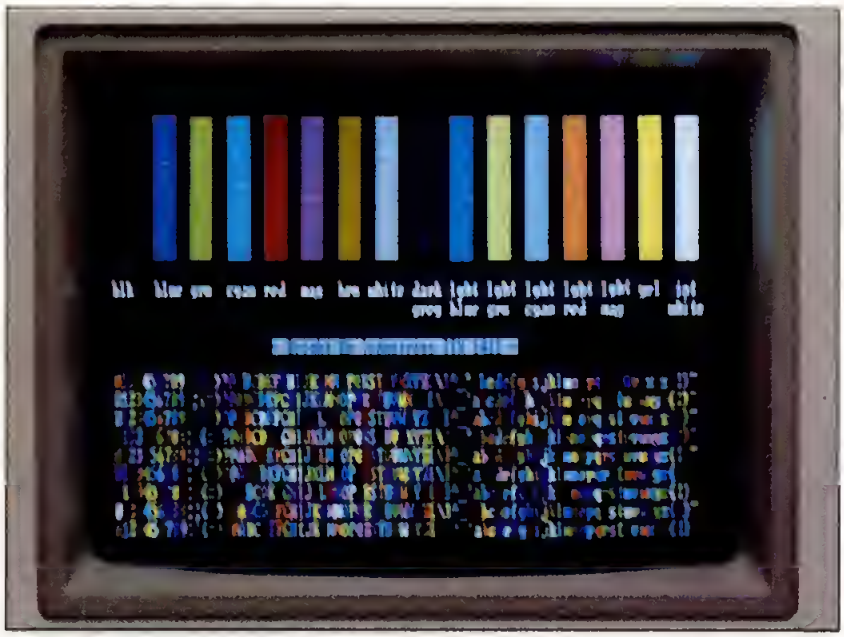
CIRCLE 147 ON READER SERVICE CARD

Five minutes after I returned the monitor to its box, it was still warm. Between this inability to dissipate heat quickly and the poorly designed mode knob, I question the monitor's workmanship and reliability. However, if you have a tight budget and believe you can use the mode selector, Calmex's KF-300M may be worth considering.—**Vincent Puglia**

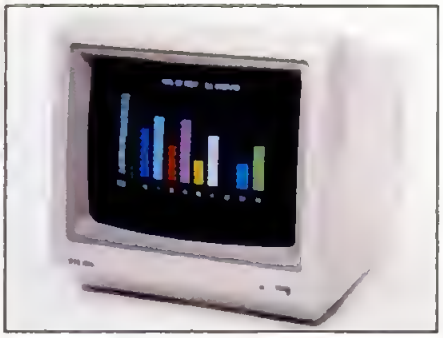
IBM COLOR DISPLAY

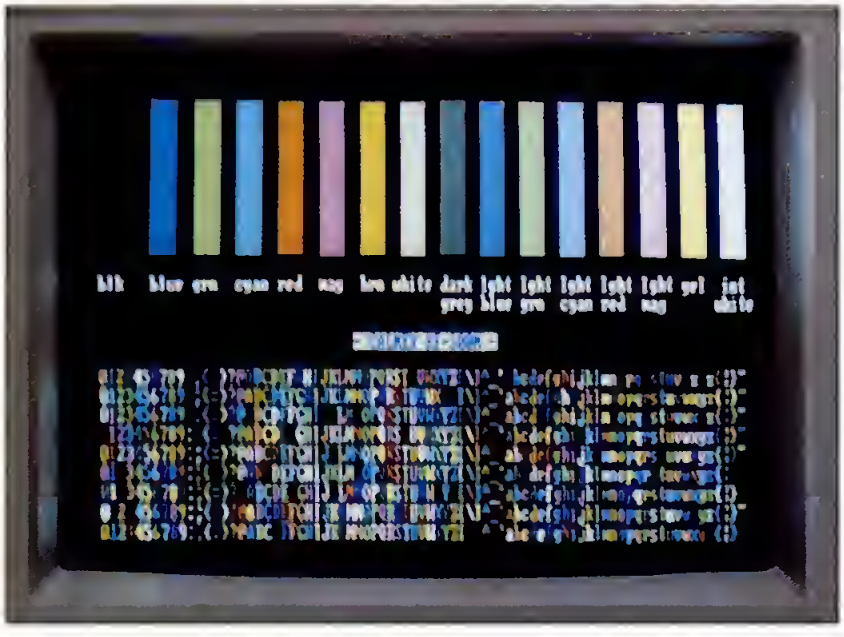
Some monitors offer text modes and alternative palettes. The IBM Color Display gives you the simple necessities: eight colors with two intensities each and a minimum of controls. IBM's approach seems to be, turn it on and forget it exists. To a large extent, you can.

Compared to many of the monitors reviewed here, the Color Display may seem to be virtually devoid of controls, but the few it does have are all most people need. The front panel sports the now-familiar power, contrast, and brightness control knobs. Calibrating the brightness and con-

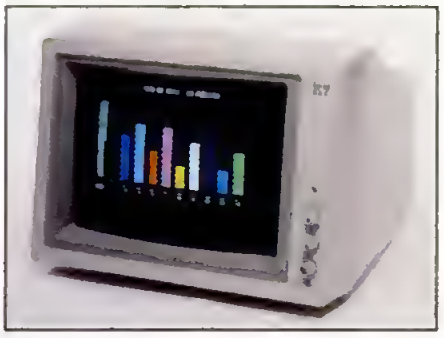


Bright Up's TTX-1411 offers plenty of well-placed user controls and extremely good high-voltage regulation, image resolution, ond almost perfect color convergence that doesn't deviate by more than o 1/2 dot width in one corner. However, the monitor's brightness and contrast controls could stand improvement. Although its yellow looks o little greenish and its gray blends into black unless the brightness control is turned quite far up, the TTX-1411 is an RGB monitor with strong colors.





The Calmex KF-300M's grid line benchmark results brought to our attention this color display's tendency to distort vertical lines. The monitor's colors and resolution are similar to the IBM Color Display, including the minor convergence in the corners. The slight red tinge apparent in the corner dots is not o large problem, particularly since the definition is very good, with little to no elongotion. The KF-300M's front panel holds the brightness, contrast, and mode controls.



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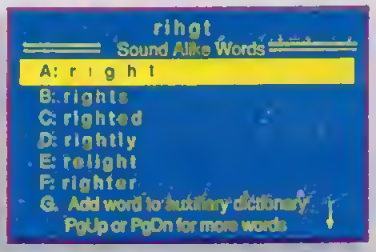

So you move your cursor to "A," which is the right "right," hit Return and the spelling mistake is instantly fixed. And the program you were working on has continued to run while you did a little spelling sidetrip with *Turbo* Lightning. *(If you'd rather not remember your spelling grades in school, the beep might make you nuts, but you can choose the "whole page" option. Which means that when you finish writing the entire page, any spelling mistakes will be highlighted. You go in and straighten things out straight away.)*

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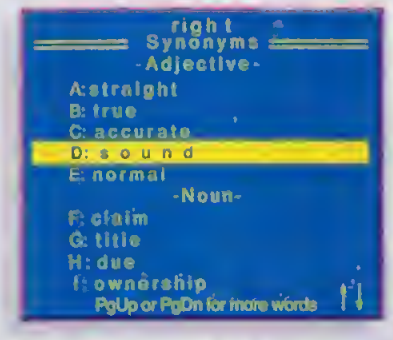

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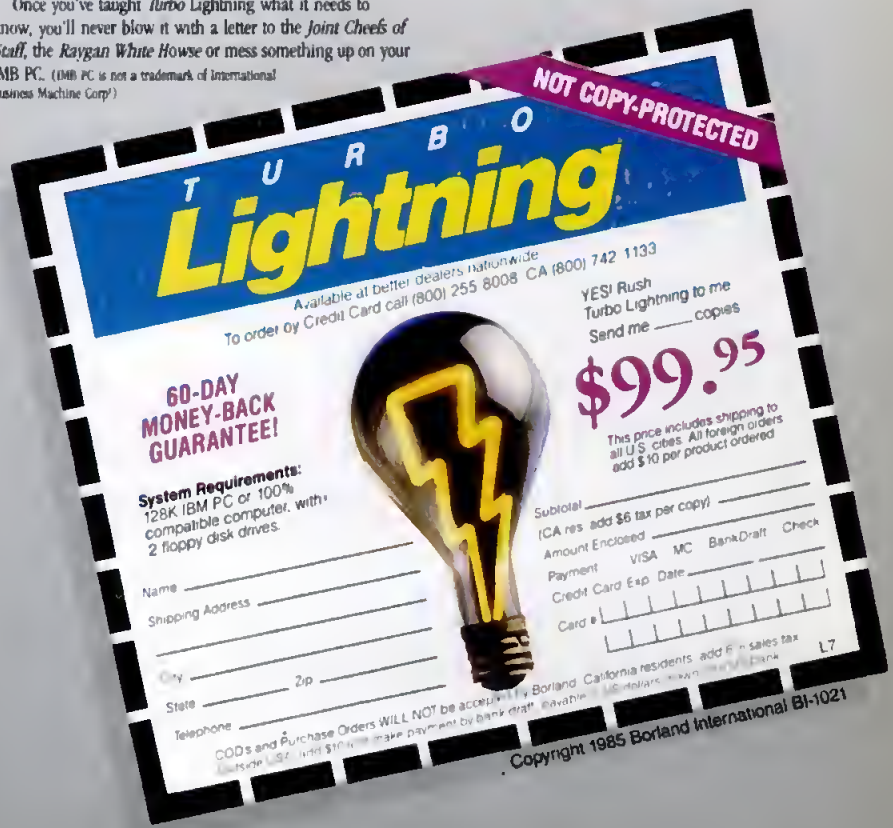
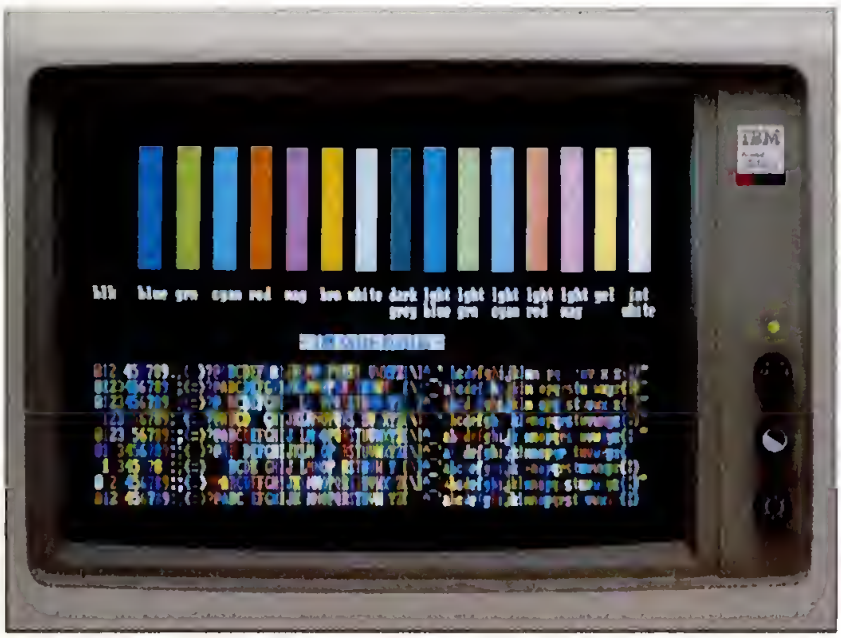


trast to some predefined setting is possible to some extent because the knobs are ribbed and include visual settings. Located on the rear panel are the vertical size and vertical hold knobs. The former control is useful for changing the horizontal/vertical ratio for certain graphics effects.

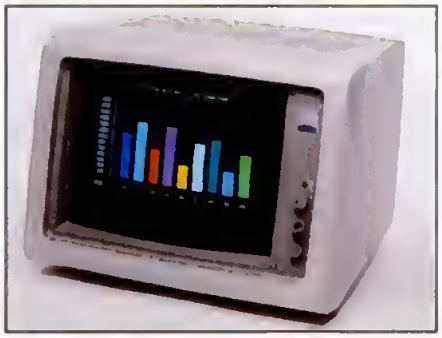
One of the first things you notice about the Color Display is the reflectivity of its jet-black background. This is one of the trade-offs you must accept in order to have a highly contrasted black-and-white display. While this property may annoy you initially, it isn't overwhelming, especially once you are in the middle of a session.

The colors you'll see on the Color Display may not have the intensity and purity you would want, but they are the ones users have come to expect. Adjusting the brightness and contrast controls can remedy the situation, but doing so usually knocks some other color out of whack, most often gray or white.

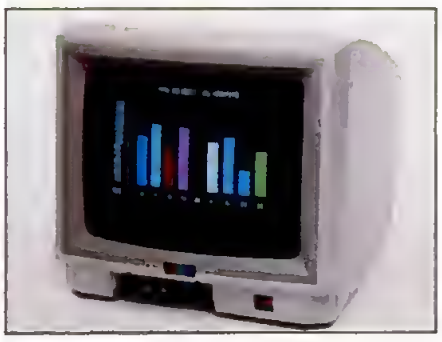
Text legibility on the Color Display is another sore point with many users. The characters tend to be fat and have highly visible bands of the background color run-



Although the fat characters with bands of background color running through them are a well-known annoyance of the IBM Color Display, the unit has almost no distortion in vertical lines and a fairly good high-resolution mode. Aside from the reflectivity of the jet-black background, certain color combinations, including green or white with cyan, are illegible. A foreground/background combination of red, blue, and white brings out the best legibility, as does yellow text on almost any background.



Despite the appearance of a slight reddish tinge in its gray, the Microvitec 890/DI's colors show up clean and crisp. Its scores on the linearity and color convergence tests were somewhat disappointing, though. The 890/DI's aspect ratio was off a bit, with an oblate text pattern and 1/4-inch out-of-round test circle. The brightness and contrast controls, adjustable through a sufficient range, have been placed behind a door under the center screen.



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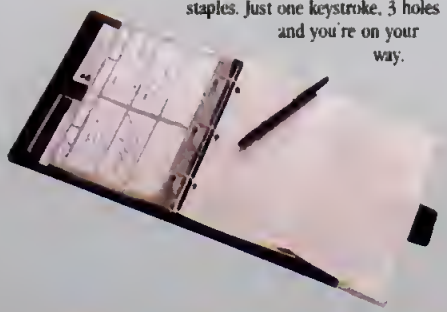

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CIRCLE 139 ON READER SERVICE CARD

ning across them. While you can get used to them, they are far from the best-defined characters available. Aside from the blockiness of the individual characters and the ever-present reflectivity, certain color combinations, such as any combination of green or white and cyan are totally illegible. Also, gray text on a black background tends to disappear during blinks, and virtually any combination with brown is repulsive. You get the best legibility by using a foreground/background combination of your everyday patriotic colors: red, blue, and white. Yellow text on almost any background is also highly legible.

When we tested the monitor for color alignment, red and blue fringes were apparent on the upper portion of the horizontal lines. This misconvergence means that white and probably the other colors are not as pure as they could be. Another test showed that while the middle third of the screen is properly focused, the other two thirds are elongated. The elongation, however, wasn't a major factor in the grid test. In fact, the Color Display is one of the few monitors that had almost no distortion in the vertical lines. Finally, the high-resolution mode is relatively good, demonstrating only some slight convergence in the corners; none of the other monitors PC Magazine Labs tested could boast better resolution.

The IBM Color Display may not be the best RGB monitor on the market for CGA-compatible cards, but it is better than most. You should look at it if for no other reason than its status as the standard against which other RGB monitors are judged.—**Vincent Puglia**

PC MAGAZINE FACT FILE

Color Display
IBM Entry Systems Division
Boca Raton, FL
(800) 447-4700
List Price: $680
Requires: Color/graphics adapter.
In Short: The standard by which all others are judged, the IBM Color Display has no controls other than the bare essentials and doesn't need any more. Its colors and contrast are better than most, but its poor text legibility is its biggest drawback

CIRCLE 657 ON READER SERVICE CARD

GLOSSARY

Aspect ratio: The ratio of the horizontal pixel spacing to the vertical line spacing. Deviation from the standard aspect ratio for a particular display can distort such geometric shapes as circles and squares.

Bandwidth: The maximum frequency of color signals that the display can respond to. The higher the bandwidth, the higher the resolution and the sharper the image that can be displayed.

Color convergence: A measure of the alignment of the red, green, and blue dots. The three must converge on exactly the right point. Poor color convergence causes images with color fringing or rainbowlike shadows on the sides of white lines.

Convergence: The resolution at the corners of the display.

Degauss: To demagnitize the monitor face in order to improve convergence and linearity.

Dot pitch: The spacing between each trio of red, green, and blue dots that comprise a pixel. The dot pitch density determines the fineness of detail.

Linearity: A measure of the straightness of horizontal and vertical lines on the display. An object with a given height will have the same height elsewhere. Linearity distortions can result from the shape of the color tube.

Vertical sync recovery: The stabilization of the monitor's vertical oscillator following a momentary loss of the vertical sync signal (generally following a change of the video mode).

MICROVITEC 890/DI

Microvitec's 890/DI (also known as the Cub) is a no-frills monitor designed to give you the benefits of an RGB with the simplicity of a monochrome monitor. At first glance, the power switch is the only control you see, but upon closer inspection, you'll notice a door under the center screen that opens to reveal brightness and contrast controls. You can set these and then forget about them.

When I first plugged it into a PC, I wondered if the 890/DI was intended for enhanced graphics, because the screen was way out of sync horizontally. The sketchy documentation was of little help and contained no operating specifications. I traced the problem to the polarized connector that plugs into the monitor. Similar to the round connectors on the back of a PC for the keyboard or cassette, the little ridge that's supposed to ensure that you don't plug it in wrong wasn't prominent enough to do the job.

The 890/DI proved to be a good performer in the color department. With the exception of a slight reddish tinge in the gray, its colors are clean and crisp. For text use, performance is perfectly acceptable both in white on black and in color. Contrast is good, and you can adjust through a range that is more than ample.

The aspect ratio is off somewhat, making our text pattern noticeably more oblate than circular and our test circle about ¼ inch out of round. While this degree of variation would not be serious for most purposes, unfortunately, the 890/DI has no user-accessible adjustment control. Both the linearity and color convergence of the unit I tested were disappointing. The entire left quarter of the screen was off by nearly a full dot width on the convergence test.

The 890/DI earns a mixed review. This newcomer from a British company has good color and is admirably simple to operate, but its overall image quality doesn't measure up.—**Jim Forney**

PC MAGAZINE FACT FILE

890/DI
Microvitec Inc.
1943 Providence Ct.
College Park, GA 30337
(404) 991-2246
List Price: $575
Requires: Color/graphics card.
In Short: The Microvitec 890/DI is easy to use, but its simplicity comes at the expense of functionality. Image quality is mediocre.

CIRCLE 678 ON READER SERVICE CARD

RGB: COMPUTER COLOR FROM THE INSIDE

They may look like color televisions, but RGB displays are a different breed, producing higher-quality images with digital circuitry.

The digital RGB monitor as we know it today has evolved into a highly sophisticated device, a far cry from early efforts that resembled crude adaptations of home televison sets.

RGB monitors may still look a lot like color TV sets, but they are a different breed. Of course, some basic similarities persist: Both most often are designed around cathode ray display tubes containing three separate electron guns to excite three different sets of colored phosphors that, in combination, can produce a kaleidoscope of colors. And both depend on a raster technique of horizontal sweeps stacked one above the other to sequentially excite the whole screen area, depending on the persistence of the glowing phosphor dots to conceal the fact that the beam has come and gone until it returns to reexcite each area.

Beyond that point, however, the two technologies have taken off in quite different directions. Computers use digital circuitry while the television industry clings tenaciously to analog.

What makes digital technology so great? Let's look at how a digital display works in its most elementary form.

Imagine that the screen of an RGB monitor is divided up into a lot of little squares—for instance, a quarter of a million little squares.

Each of these squares is unique in that it is capable of displaying something totally different from what is being displayed by any adjacent square. On a standard RGB screen, one of these islands measures a little less than half a millimeter, or 1/50th of an inch, across. As a function of the design of the CRT tube itself, the effective size (dot pitch) and spacing of the individual phosphor dots are the ultimate limit.

You may not actually display different image information in every single island; you may group several adjacent islands together and address them as an inseparable group. But how you do that is largely a function of the circuit board that drives the monitor and the software that drives the board. Regardless of how small the individual islands, how small the finest detail the screen is capable of resolving, what you see is determined primarily by what goes on inside the computer.

Using an IBM Color Graphics Adapter, the resolution of most monitors is normally listed as 320 by 200. This means that no matter how big the screen is or how infinitely small the separate phosphor dots are, the graphics card is going to arbitrarily divide the display horizontally into 320 units and vertically into 200—64,000 little squares or rectangles.

> ■ A smaller dot pitch will generally produce a more pleasing and uniform visual effect.

If we started with 250K-byte islands of phosphor dot groups, each of the squares or rectangles into which the IBM board is going to lump them—called pixels, short for picture elements—will contain an average of four. Not that each pixel the monitor card addresses will be a 2-by-2 bundle; the configuration of the individual pixels will vary depending upon where the boundaries of the 64,000 electronically determined divisions fall.

The smaller the size of the phosphor dots—a spec called dot pitch—in relation to the resolution the rest of the system supports, the more nearly uniform the groupings of phosphor dots within each pixel will be. A smaller dot pitch will generally produce a more pleasing and uniform visual effect, even though it is the attendant circuitry and not dot size that usually determines resolution.

The next step is to assign each pixel a discrete, fixed address so that you can always come back to exactly that same part of the screen. For instance, you can make a spot move across the screen by simply creating a dot electronically, starting it at one address and then moving it sequentially from address to address, horizontally, vertically, or in combination. This is how animation is produced on the PC.

Because you are dealing with 64,000 addresses, you have to store 64,000 chunks of information—actually more, because an RGB display must have separate red, green, and blue data for each pixel as well as a means of finding the right pixel for the data in that sea of little color islands.

You can squeeze all of that information into only 32K bytes of precious computer memory for RGB graphic displays; text only uses 4K because the character block or matrix of 25 lines by 80 characters is so standardized. You pay a price for using that little memory: You have to limit the data you can supply to each of the phosphor colors to the binary choice of on or off. This means that the 3 colors used individually or in combination can in fact produce 7 colors plus black, and if you add a simple brightness attribute, which doesn't eat very much memory, you can double that number to 16.

Unless we add a lot more display memory, 16 colors is the practical limit on what you can expect from your desktop PC. *[Special graphics boards can greatly increase that number; see "Hard Disk Cards: An Expensive Solution Worth Considering" in this issue.—Ed.]* Still, the RGB monitor has come a long way.—**Jim Forney**

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CIRCLE NO. 141 ON READER SERVICE CARD

...ng material

PANASONIC TX-12H3P

Big performance in a small package describes this 12-inch RGB monitor from Panasonic. Except for a slightly smaller screen, it's remarkably similar to the standard IBM product in terms of image quality and control function, but Panasonic has added a few features, such as a built-in tilt/swivel base.

The TX-12H3P's linearity and color convergence are good; both are less than one dot width except in one extreme corner of the screen. Text is sharp and clear both in white on black and in color. Resolution of fine details is excellent, with good contrast right down to the smallest details.

The screen image expands and contracts a little more than I like to see; and changes from normal to bright text indicate that the high-voltage regulation could be improved. Vertical sync recovery shows more bounce than some other monitors, but this is not a serious fault.

Like the IBM Color Display's, the Panasonic TX-12H3P's contrast adjustment essentially changes only the brightness of the low-intensity colors as a group when compared with the eight high-intensity colors, without changing the contrast or intensity of that brighter group. This adjustment is effective and certainly acceptable, but it can produce some strange effects, including a reversal when dealing with gray (low-intensity white) on gray as set by the bright-attribute colors. The grays are clean with no apparent color tinging.

In addition, the aspect ratio of the unit we tested was not very good; our round test target looked more like a football. To make matters worse, this monitor has no accessible adjustment for vertical size. Panasonic assured me over the phone that the unit should not have been received in that condition and suggested returning it for adjustment.

Because time did not permit us to do that, I attacked the problem myself—not something you should attempt with a Swiss army knife, I found. Panasonic has chosen to deny you access to a simple control mounted on the rear of the chassis except with a special tool.

Maybe I'm just too used to having knobs to turn, but I'd like to see a few more adjustments accessible to the user than this Panasonic monitor provides. Overall, though, the performance of the TX-12H3P is impressive. It rates among the better monitors in this group.—**Jim Forney**

PC MAGAZINE FACT FILE

TX-12H3P
Panasonic Industrial Co.
One Panasonic Way
Secaucus, NJ 07094
(201) 348-5200
List Price: $619
Requires: Color/graphics card.
In Short: The Panasonic TX-12H3P is an attractive monitor more similar in control functions to the IBM Color Display than most. One extra is a built-in tilt/swivel base.

CIRCLE 677 ON READER SERVICE CARD

PRINCETON GRAPHIC SYSTEMS HX-12

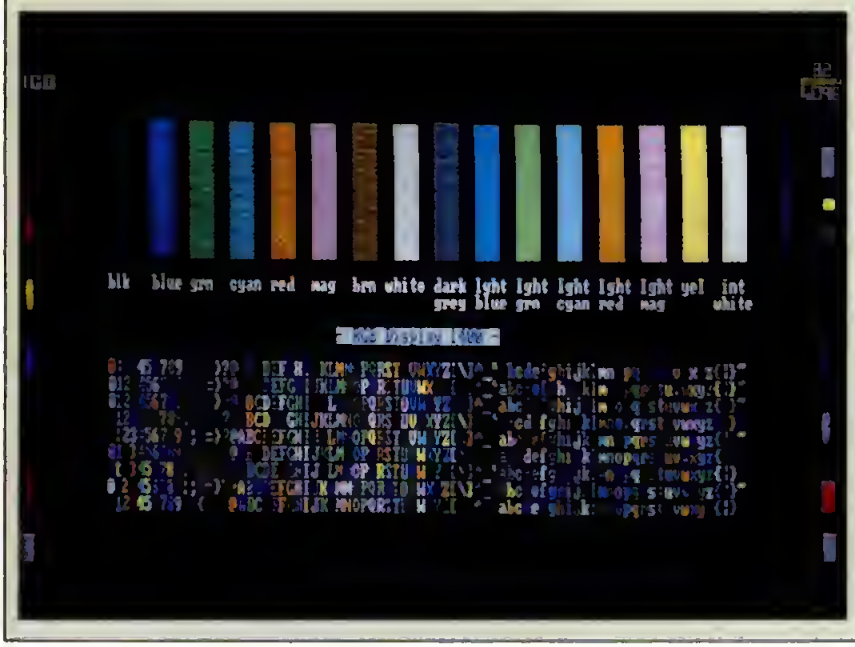
Since its introduction, Princeton Graphic Systems' HX-12 has become one of the more popular alternatives to the IBM Color Display, offering many of the same capabilities at a comparable price ($695). This no-nonsense RGB monitor may fall short of the mark for a precisionist or die-hard colorist, but its overall performance in the benchmark tests shows that it is a more than adequate color display.

Panasonic's TX-12H3P matches the IBM Color Display on image quality and control functions, but it includes some improved ergonomics. It produces good linearity, resolution, and color convergence, as well as sharp text in either black and white or color. The aspect ratio could be improved, and the screen image expands and contracts more than it should. Controls are effective, but the TX-122H3P doesn't give the user a way to adjust vertical size.

At 35 pounds, the HX-12 is far from the lightest monitor tested for this roundup. Fortunately, the only reason to shift the monitor, once it is settled in place, would be to reach the rear-panel controls. Because these controls adjust the horizontal and vertical holds, two features that are rarely out of sync, the weight is not much of a factor. The HX-12 comes with only two other controls: one for power and the other for brightness. While other monitors, such as the Wyse WY-620, also lack a contrast button, the HX-12 really suffers from the omission.

The grid-line benchmark demonstrated an extremely noticeable distortion in the HX-12's drawing of vertical lines. Each vertical line showed a distinct wiggle that started immediately below the horizontal and continued halfway to the next horizontal. This problem may be caused by a misfiring of the horizontal sweep; however, there is no way you can correct this on your own. The lack of a contrast control prevents even the cosmetic adjustments I performed on the Amdek Color 710 (which had the same problem to a lesser degree).

Princeton Graphic Systems' popular HX-12 looks much like the IBM Color Display, but it's more than an IBM clone. Some of its colors are better than the IBM's, and in some color combinations its text is more legible. The HX-12's aspect ratio is good, but its vertical lines are slightly distorted. A contrast control might help, but the HX-12 lacks one. This omission makes it especially difficult to get sharp images when working with two colors of similar intensities.



The RGB Display Corp. 1400's screen is bordered by over a dozen user control knobs that let you fine-tune this display to your heart's content. The RGB generates good quality images and requires little adjusting. Its contrast and resolution are good. Text display is not outstanding, but in black and white it's better than on the IBM Color Display. The standard 16 colors are clean, and some of the more esoteric controls con produce unusual effects.

Amdek challenges you to read between the lines.

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Not all monitors are created equal. And no monitor in this price range can equal the new Amdek Color 722.

What makes the 722 RGB monitor so distinctive? For one, a dual frequency output that is capable of supporting IBM's Enhanced Graphics Adaptor. The result is 350 lines of resolution, assuring you of a sharper, crisper image that makes your graphs and charts look more like a work of art, and less like a rough sketch. For another, the fact that the 722 is made by Amdek —where monitors are our only line, not just a sideline.

The high performance 722 features an etched glass, non-glare screen that's easy on the eyes, plus front-mounted controls that are easy on the operator. This means less eye fatigue and greater productivity.

What's more, the 3-position text switch enables you to choose green, amber or full-color type — up to 80 characters in width x 25 lines of text. There's even an optional tilt/swivel stand that allows you to select a viewing angle that's most comfortable for you.

It all adds up to more monitor for the money, and is backed by more warranty for your peace of mind. Amdek's warranty protects your investment for three full years on the CRT, and two years on all other parts and labor. No other monitor warranty offers you more.

For high resolution performance, see the new Amdek Color 722. We know you'll be impressed. After all, everytime an Amdek monitor is sold, we know that we are putting our image on the line.

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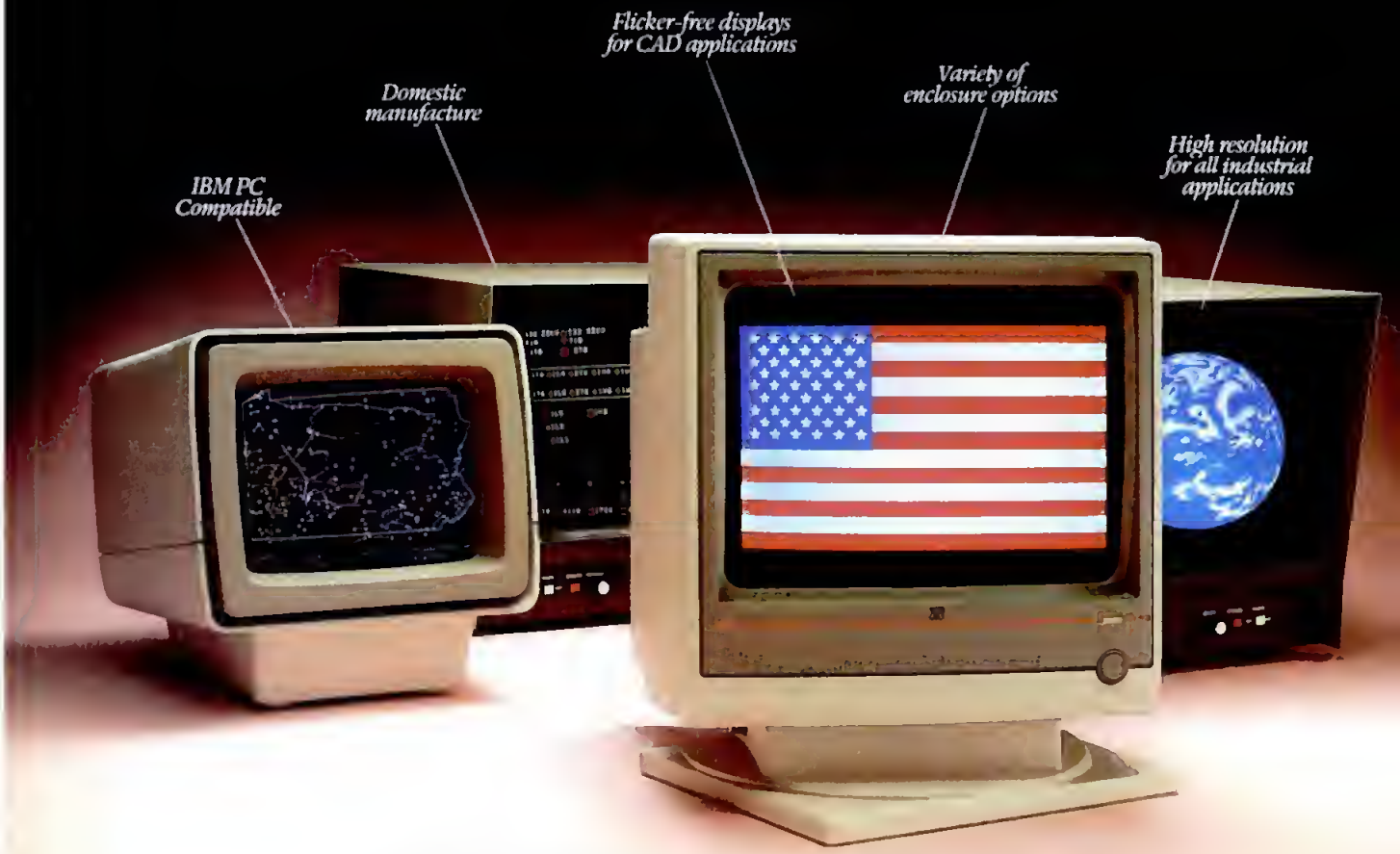

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CIRCLE 241 ON READER SERVICE CARD

In fact, when I turned the brightness control down completely, the vertical lines disappeared. The horizontal lines showed definite traces of green and blue, indicating a misalignment.

On the positive side, the linearity dots test indicated that each dot was properly focused and completely white, with no visible elongation even at the edges. Another benchmark test plainly showed the horizontal/vertical ratio to be equal to that of the IBM Color Display; that is, circles appeared as circles.

Rather than reflecting light, the HX-12 screen absorbs it, causing the black to appear muddier than on the IBM Color Display. In itself, this muddiness is no great disaster, but because there is no contrast button you have no choice but to turn up the brightness to get sharp images, especially when you're working with two colors of almost the same intensity, such as dark gray on black and yellow on brown. On the other hand, with combinations like white text on a blue background or light gray on a black background, legibility is much better than on the IBM Color Display. As for the other colors, the yellow is purer, the brown leans toward the yellow, and the green is lime-colored, indicating some red impurity.

Princeton Graphic Systems provides a number of options for the HX-12. Among them are a tilt/swivel base for $39.95, a green/amber switch that connects to a cable in the back for $24.95, and a PC*jr* adapter for $19.95. The Princeton HX-12 may not be a clear-cut winner, but it is a strong contender.—**Vincent Puglia**

PC MAGAZINE FACT FILE

HX-12
Princeton Graphic Systems
170 Wall St.
Princeton, NJ 08540
(609) 683-1660
List Price: $695
Requires: Color/graphics card.
In Short: Princeton's HX-12 surpasses the IBM Color Display in controls and performance, except for the lack of a contrast button and the failure of its vertical lines to line up perfectly.
CIRCLE 678 ON READER SERVICE CARD

RGB DISPLAY CORP. 1400

I'm not entirely sure whether I like RGB Display Corp.'s 1400 because of its dozen or so switches, knobs, and adjustments—or in spite of them. I suspect it's because of them; the 1400 has a switch or knob for fine-tuning just about any feature a hardware junkie might want to fine tune, as well as an excellent built-in test pattern that you can run to check the monitor's performance. The most esoteric of the controls degausses the system to eliminate stray magnetic fields; it's valuable, of course, but for everyday use, you're more likely to rely on the 1400's vertical- and horizontal-shift knobs, which allow generous adjustments in both axes.

■ If you want or need a color monitor that puts you in the driver's seat rather than just taking you along for a ride, the RGB 1400 could be the one for you.

All these knobs and doodads could turn out to be more of a nuisance than a blessing to the average user. But if you want or need a color monitor that puts you in the driver's seat rather than just taking you along for the ride, the 1400 could be the one for you.

Like most standard RGB monitors, the 1400 will display 16 colors, but at the touch of one of the front-panel switches, it will change the attributes of those colors to assign them to different areas of the screen image. This switch produces some bizarre effects, but for abstract subject matter or in applications where tone/color separation is important, it can significantly improve the visual effect.

For special applications, you can rearrange the PROM chips that control color attributes, and the colors can be fine-tuned even further via separate adjustments for each of the screen's primary colors (red, green, and blue).

The 1400's resolution is good, with fine detail well resolved without being mushy. Text is acceptable in white on black and in color—at least when you compare it to the text on the IBM standard color display. Its colors are clean-looking; you can attain a good gray at normal brightness settings without desaturating the yellow. Color contrast can be varied by means of the "color gain" control on the front panel, and a tinted screen contributes to the 1400's overall good contrast under typical lighting conditions.

RGB Display Corp. claims that it has been the primary supplier of RGB displays to the video-game industry since 1978. Like arcade video-game machines, RGB Display Corp.'s PC monitors are designed to operate 24 hours a day, 365 days a year, in a true 100 percent duty-cycle environment.

Variations on the basic model that the PC Magazine Labs reviewed here are available for either digital or analog inputs, with a choice of scan rates suitable for either standard or extended graphics capabilities.

There's no question about it: The RGB Display Corp. 1400 is a heavy-duty monitor, probably too heavy duty, in fact, for the average user's needs. For specialized applications or for especially heavy use, however, you may not find another one like it.—**Jim Forney**

PC MAGAZINE FACT FILE

1400
RGB Display Corp.
22525 Kingston Lane
Grass Valley, CA 95949
(916) 268-2222
List Price: $595
Requires: Color/graphics card.
In Short: The RGB 1400 is a versatile unit with unusual features, including reprogrammable PROMs to change color choices. It is suitable for heavy-duty use, but its many controls may overwhelm the average user.
CIRCLE 679 ON READER SERVICE CARD

SAKATA SC200

From your first glance, you'll realize that the Sakata SC200 was designed for heavy usage in an office environment. After test driving it, you'll also realize that this monitor was designed to be nearly foolproof for nontechnical users. Sakata has succeeded in both categories but not without some sacrifice in performance.

One of the first things about the unit that shouts heavy duty is the solid cast metal shell on both ends of the cable that connects the SC200 to your PC's graphics card. The monitor end locks securely in place with a spring lock arrangement, and the lock screws on the PC end have long shafts that are knurled as well as slotted so that you can screw them in with just your fingers—there's no excuse for not properly securing this cable. Both ends are also fitted with strain reliefs.

The SC200's color convergence and linearity are quite good; the maximum color spread is equal to about ½ dot width in a couple of extreme corners. The aspect ratio is also good: The horizontal and vertical measurements of our test circle were identical for all practical purposes.

The resolution of the SC200 is disappointing; it tends to get mushy in fine-detail areas, resulting in a definite loss of contrast. I suspect this problem can be attributed either to Sakata's choice of CRT or to the attendant circuitry.

The glare from the SC200's screen is somewhat greater than that of other monitors, and the difference is fairly obvious when you put this monitor alongside an IBM Color Display for comparison. Glare contributes only slightly, however, to a contrast problem that is the SC200's greatest shortcoming.

The contrast problem begins with the lack of a contrast adjustment. Not all monitors have or need a user control for contrast, but this one does. If you try to obtain a good gray using only the brightness control, the lighter colors—particularly yellow—appear rather washed out. Set for what I considered a good yellow, the gray test bar slipped to an almost imperceptible light black. The SC200 has a subbrightness control that I hoped might function as a contrast control, but this knob mainly sets the upper and lower limits of the brightness range you can adjust using the brightness control.

■ The Sakata SC200 was designed to be nearly foolproof for nontechnical users.

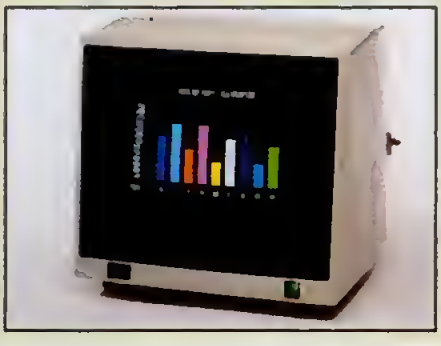
Except for the gray/contrast problem, the SC200's colors are pretty good except for white, which has a slight lavender tint. Text is generally good in both white on black and color. The Sakata SC200's drawbacks outweigh its advantages, however, and although it is reasonably priced, it's no bargain.—**Jim Forney**

PC MAGAZINE FACT FILE

SC200
Sakata USA Corp.
651 Bonnie Lane
Elk Grove Village, IL 60007
List Price: $599
Requires: IBM or equivalent color/graphics card.
In Short: Loss of contrast and mushy appearance in fine detail characterize the Sakata SC200's performance. It has a serious contrast problem that is not completely correctable with user controls.

CIRCLE 674 ON READER SERVICE CARD

The Sakata SC200 is constructed like a piece of heavy-duty equipment, and it looks it. To help this solidly built monitor stand up to heavy use, Sakata limited its user controls, leaving out a much-needed contrast adjustment. While the SC200's colar convergence, linearity, and aspect ratia are all good, its resolutian is below average and its contrast, poor ta begin with, is even worse in areas of fine detail. A black and white mode is useful for improving text legibility.



SONY TRINITRON COLOR TV KV-1131CR

A combination color monitor and television set, the Sony does many things, but not all of them well.

Some people live by the tube; others work with one. If you fall into the first category, the Sony Trinitron Color TV KV-1131CR should probably be on your must-buy list. This monitor functions in both digital and analog modes; flip a switch or two, and you toggle from a word processing session to a videotaped sales presentation and then to your favorite television program.

To support these options, the KV-1131CR has more buttons and plugs than a four-star general has ribbons. The vast majority, however, are related to the TV and VCR modes, and so computer users need be concerned with only a minimum of controls. For example, of the seven visible controls on the front of the monitor, only two—power and RGB select—affect the computer's display. Located on the monitor's side are four additional display controls: horizontal center, vertical hold, vertical size, and brightness, as well as a switch for toggling between analog and digital modes. When the switch is set to digital mode for use with the IBM PC, the related interface cable requires an eight-pin connector.

Being a jack-of-all-trades must be tiring because the KV-1131CR's colors are washed out, owing to its inability to achieve a good contrast. White tends to be grayish, and light gray comes across as a dark gray. Adjusting the brightness control corrects this somewhat, but it is impossible to get a jet-black background. On the other hand, a few colors are richer than those found on the IBM Color Display. For example, brown is chocolate-colored and red is a deep maroon.

Text legibility also suffers from the lack of contrast, especially when you use colors within a similar range, such as gray text on a black background. The legibility improves with highly contrasted colors, such as white letters on a black or blue background. But with yellow text on a brown background, the brown shifts in intensity when the screen blinks.

As it comes out of the box, the KV-1131CR's horizontal-to-vertical ratio is 1.40 (the IBM Color Display has a 1.33

(continued)

PC MAGAZINE FACT FILE

Trinitron Color TV KV-1131CR
Sony Corp. of America
Sony Dr.
Park Ridge, NJ 07656
(201) 930-1000
List Price: $595 (digital cable, $60)
Requires: color/graphics adapter.
In Short: The Sony KV-1131CR is both a color television and an RGB monitor, but its colors are washed out, its contrast is mediocre, and its resolution is fuzzy.

CIRCLE 658 ON READER SERVICE CARD

If this Sony monitor reminds you of your color TV, that's because it is a TV. The flip of a switch toggles you into digital mode, in which the Sony KV-1131CR is only a fair color display. Because of poor contrast, its colors are washed out, a problem that adversely affects text legibility. A more serious problem is the Sony's poor resolution. The central pixels are elongated rather than circular, and lines converge more in the corners than they should.

("Sony Trinitron Color TV KV-1131CR" continued)

ratio), making for elongated circles. However, the ratio is easily adjusted with the vertical size control.

More of a problem, however, is the monitor's lack of sharp resolution; lines converge in the corners more so than they would on an IBM Color Display. Also, although dots show no distinct color separation, they do have a tinge of blue throughout, and grid lines painted with gray or blue almost blend into the black background. When the lines are white, they have a definite wave on the borders (especially in the upper-left corner) rather than a ruled look. Finally, one benchmark showed that even the center pixels on the KV-1131CR are elongated instead of circular.

As though I did not test the television mode, I suspect that it is quite above average—after all, the unit is a Sony. So, if you need a backup monitor and would like to have a second television set, look at the Sony Trinitron Color TV KV-1131CR. However, if you intend to spend more time in front of the monitor working with applications programs than watching prime-time programs, remember that a general practitioner is not the person you want to see when you need a triple bypass.—**Vincent Puglia**

THOMSON CM 36382 SI

The Thomson CM 36382 SI is a 14-inch RGB monitor that does not exact the usual sacrifice of clarity in exchange for a large screen. Its excellent range of front-panel controls allows you great flexibility in fine-tuning the display while remaining seated—an obvious advantage that many manufacturers do not offer.

The Thomson's text and color display are exceptionally clear, much better than that of the IBM Color Display. You also have a lot more control over the output with the Thomson. A touch of your finger opens a horizontal door beneath the screen, revealing no less than eight controls (compared to only three on the front of the IBM). These include the common brightness, contrast, and volume controls, as well as the not-so-common horizontal picture shift (which moves the display to the left or right on-screen), vertical synchronization (to control jumping or jitters), vertical picture amplitude (to stretch and shrink the height of the display), intensity (for contrast of bold colors), and a switch for changing from a color display to either green or amber monochrome for text editing. A focus control, preset by the manufacturer, is located on the back panel.

All the controls are set by the manufacturer, so I didn't need to fool around with them at all. However, it's difficult to resist fiddling with all those settings, especially when you can slightly improve your display. As it turns out, the intensity and vertical picture amplitude controls are excellent for fine tuning your text as well as for tinkering with your graphics. The switch for moving between RGB color and a green or amber monochrome display helps, too.

The box-like Thomson weighs 21 pounds, which would make it rather unwieldy if not for the carrying handle recessed into the top of the monitor. The handle balances the weight nicely so the monitor can be lifted, moved, or carried with one hand.

The monitor includes a speaker that you can access with a standard RCA cinch-type phonojack, which you will have to provide.

PC MAGAZINE FACT FILE

CM 36382 SI
Thomson Consumer Products Corp.
330 Washington St., #509
Marina del Rey, CA 90292
(213) 821-2995
List Price: $529
Requires: Color/graphics card.
In Short: The Thomson CM 36382 SI is a large monitor with exceptional clarity. It offers plenty of front-panel adjustments, including one that allows you to switch from color to amber or green for text.

CIRCLE 673 ON READER SERVICE CARD

The surface of the screen is glare resistant, and it works better than any other attempt at glare resistance I've seen. My IBM monitor is as reflective as a mirror in comparison to the Thomson. Even with the banks of flourescent tubes all over the PC Magazine Lab, I could not place the Thomson monitor so as to create glare that would make the screen unreadable.

Perhaps the best compliment I can give the Thomson CM 36382 SI color display is this: I wish I were looking at it right now instead of at an IBM Color Display. Not only would my screen look better, but I'd have money left in my pocket. In fact, for the same money I paid for my IBM monitor, you could buy this Thomson RGB *and* the monochrome display of your choice.—**Phil Wiswell**

WYSE WY-620

Take a CRT tube, surround it with shrink-wrapped plastic, put it on a tilt/swivel base, and you have some idea of what Wyse Technology's WY-620 looks like.

The WY-620 differs from many other RGB monitors in other ways as well. For one thing, it does not come with its own power supply, using instead the outlet at the rear of the PC that's usually reserved for monochrome monitors. For another, its images (whether color or high-resolution black and white) are very crisp, with little to no glare.

Because of the monitor's recessed

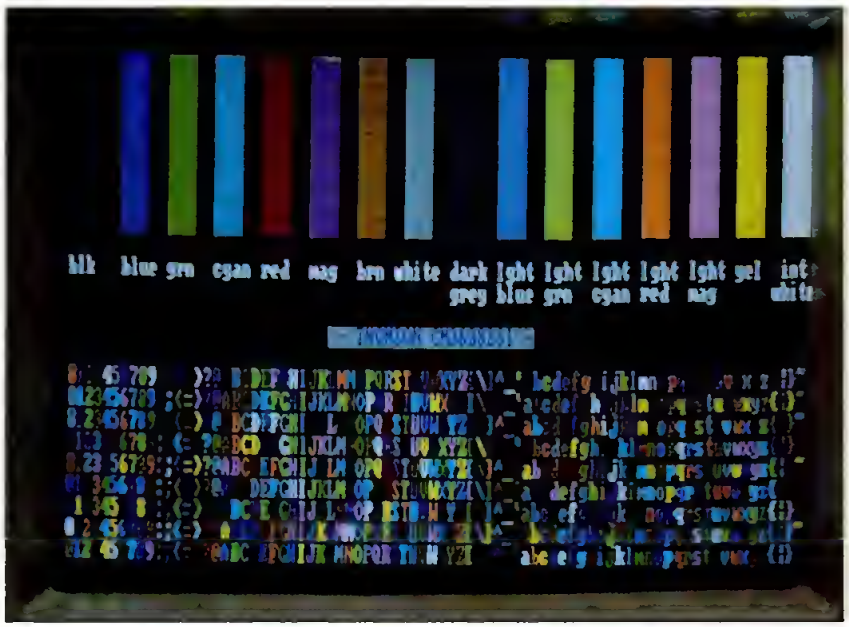
PC MAGAZINE FACT FILE

WY-620
Wyse Technology
3571 N. First St.
San Jose, CA 95134
(408) 433-1000
List Price: $545
Requires: IBM CGA or compatible.
In Short: The Wyse WY-620 is a superior monitor. It has few user controls, but its contrast is so good that a contrast control is unnecessary. Color is good, except for a brown that is too yellow.

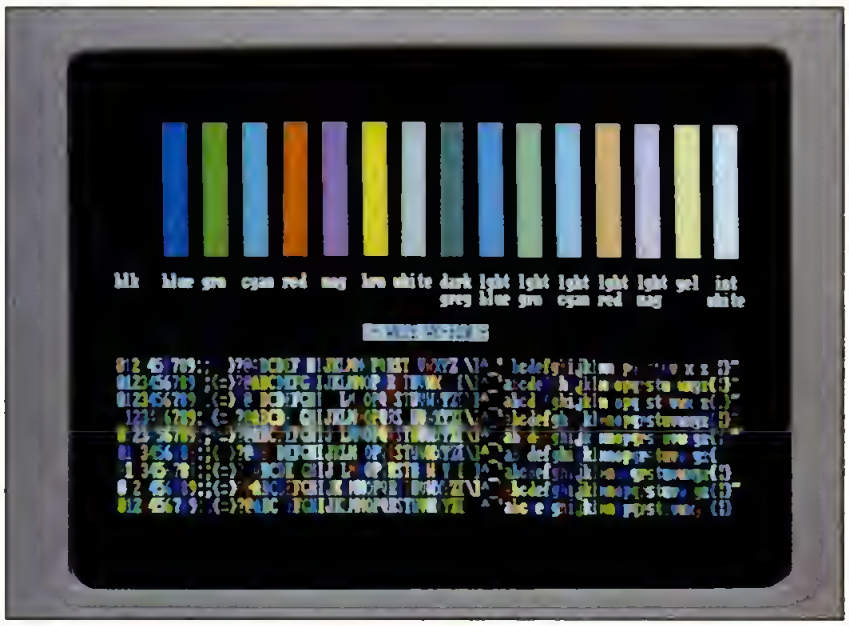
CIRCLE 672 ON READER SERVICE CARD

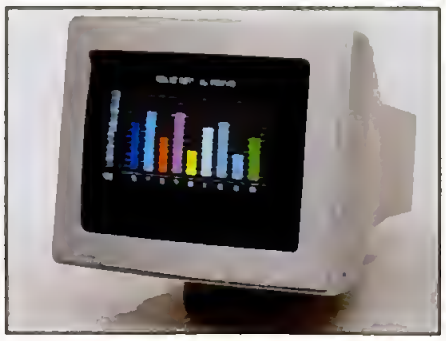
shape, it has no front panel. The power switch is on the base of the tilt/swivel pedestal, and the brightness control knob is located on the bottom left corner edge of the display. Turning the monitor on or off is almost like embracing someone; you need to reach between the monitor and the base to get to the switch. User controls on the WY-620 are limited to power and brightness adjustments; a contrast control is unnecessary because the images are so well defined. Of the screen's 13¼-inch diagonal area, only 11¼ inches are used for display purposes.

The WY-620 performed well above the other monitors I tested using the PC Magazine Labs benchmarks. Not only were the horizontal and vertical grid lines aligned perfectly, but each and every pixel on the screen was free of any trace of color, indicating a perfect alignment of the red, green, and blue displays. However, in comparison to the IBM Color Display, the Wyse WY-620 elongates graphics horizontally; that is, circles tend to be displayed as horizontal ellipses and, because there is no vertical size control, you need



The Thomson CM 36382 SI has a larger-than-normal screen, but the images it displays are as sharp as you'd expect to see on a smaller screen. The door beneath the screen opens to reveal a range of adjustment knobs that let you fine-tune the display even further. For text editing, you can switch from color mode to either green or amber monochrome mode. In monochrome or in color, the Thomson's glare-resistant screen is easy on the eyes.





The Wyse WY-620's unusual looks make it stand out among color monitors, and its performance is equally outstanding. Its pixels are placed in a tight pattern that results in exceptionally crisp images in both color and black and white modes. Horizontal and vertical grid lines align perfectly on the WY-620, but the monitor elongates graphics horizontally, so its circles tend to look more like ellipses. There's no user-accessible control to remedy this problem.

to make the necessary ratio adjustments in software.

While the display loses a little discernibleness when a number of lines converge in a corner, the resolution is effectively on a par with that of the IBM Color Display. The actual area affected doesn't amount to much—about a little more than a ¼-inch isosceles triangle.

The Wyse color monitor has one problem in common with a few of the other monitors tested—its brown is closer to yellow than a true brown should be. The high-intensity colors, while cleaner, tend to be less intense than those seen on the standard PC monitor. Text legibility on the WY-620 is extremely good, and virtually every color combination of text and background is readable. The only exception is yellow text on a brown background, a color scheme that is unusual under the best of circumstances but that looks, on the WY-620, like something the cat dragged in.

Wyse Technology may be relatively unknown in the PC retail marketplace, but it has been manufacturing reliable terminals for quite a while. The WY-620 may help earn Wyse a higher profile. If your system has power to spare and you are in the market for a clean, no-frills RGB monitor, the Wyse WY-620 is well worth seeing.—**Vincent Puglia** ■

CGA-Compatible Monitors: Summary of Features

Manufacturer	Model	List price	Screen size (measured diagonally in inches)	Resolution (horizontal dots × vertical lines)	Number of colors	Bandwidth (MHz)	Dot pitch (mm)	Horizontal frequency (KHz)	Vertical frequency (Hz)
Amdek Corp.	Color 600	$599	13	640 × 240	16	16	0.43	15.75	60
Amdek Corp.	Color 710	$699	13	720 × 480	16 plus 3 text modes	18	0.31	15.75	60
Bright Up Industries Inc. TTX Group	TTX-1411	$579	14	640 × 200 (up to 400 depending on graphics card)	16	18	0.39	15.75	50–60
Catmex Inc.	KF-300M Multi-Display Color Monitor	$559.95	13	640 × 400 (interlaced) or × 200 (non-interlaced)	16 plus 2 text modes	16	0.43	15.75	50–60
IBM Corp.	Color Display	$680	13	640 × 200	16	14	0.43	15.75	80
Microvitec Inc.	890/DI	$575	14	640 × 400	16	18	0.31	15.75	50–60
Panasonic Industrial Co.	TX-12H3P	$619	12	640 × 200	16	20	0.31	15.75	50–60
Princeton Graphic Systems	HX-12	$695	11½	640 × 480 (interlaced) or × 240 (non-interlaced)	16 (6 colors, 2 intensities)	15	0.31	15.7	60
RGB Display Corp.	1400	$595	14	720 × 400 (interlaced) 640 × 200 (non-interlaced)	16 with second set of 16 switch selectable	16–18	0.31	31	60
Sakata USA Corp.	SC200	$599	13	640 × 200	18	15	0.31	15.75	50–60
Sony Corp. of America	Trinitron Color TV KV-1131CR	$595	17⅛	640 × 200	16	10	0.75, 0.25	15.75	50–60
Thomson Consumer Products Corp.	CM 36382 SI	$529	14	640 × 240	16	12	0.38	15.7	50–60
Wyse Technology	WY-620	$545	13½	640 × 200	16	18	0.43	15.75	50–60

Editor's Choice products appear in red.

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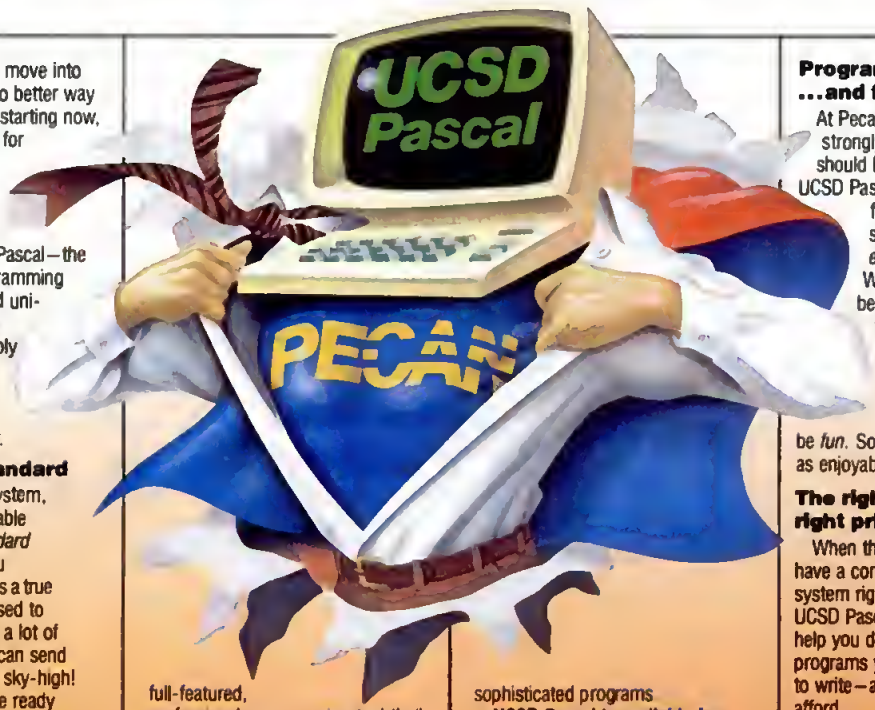

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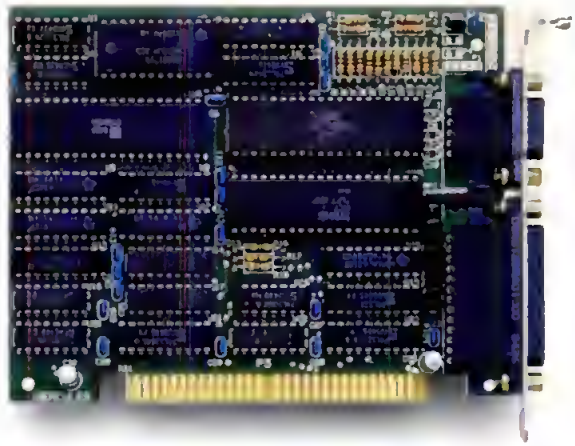

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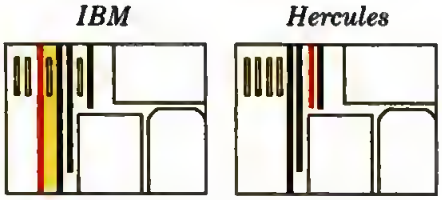

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HERE IT COMES-

THE COMPAQ PORTABLE II

Due to the Golembo Effect, a phenomenon as reliable as Gresham's Law or Maxwell's Equations, Compaq Computer Corp. can consider its new upgraded, downsized portable a winner. And so can you.

It's easy to pigeonhole the new machine from Compaq: Evolutionary, not revolutionary. The Portable II is not a laptop, not a multiuser system, and you probably won't hook it up to a network. It is the product of careful engineering and the current state of the art.

Not so coincidentally, it also fits the description that supposedly informed insiders were offering for IBM's fictitious PC II last year: 80286, 640K on the motherboard, limited expansion, and a smaller footprint. But this one has a handle. You can get it with one floppy, two floppies, or one floppy and a hard disk. The floppy drives are only ⅓-height, saving size and weight. Is the Portable II a scaled-down Portable 286 or a scaled-up Compaq Plus?

Guilty on both counts. With a brand-new motherboard that runs at both 8 and 6 MHz, it matches the Portable 286 in CPU performance but is throttled by a 10-megabyte hard disk with access times of 80 milliseconds, roughly twice those of a PC AT. Unlike the 286, it has only one 16-bit and one 8-bit expansion slot. Like the 286, it comes with one serial and one parallel port and an on-board clock/calendar. In fact, the disk controller and the two I/O ports are all on one board, capitalizing on modern large-scale integrated circuits. Of course, the Compaq Portable II uses the smaller AT-standard 9-pin serial port instead of the more conventional 25-pin connector, but both ports fit in one slot, just like they do in the PC AT.

Compaq's trademark dual-mode monitor has come up for some small improvements, as well. Despite the overall shrinking of the machine, the display size is exactly the same as that of the older machines. The tube, however, sports a new, flatter face and more attractive bezel and is much shorter overall. Such things force a complete redesign of the internal electronics, but the result is just as sharp as ever, right out to the edges.

Dual modes notwithstanding, the monitor is still monochrome. I would

A full 17 percent lighter than the original Compaq, the Portable II has PC compatibility, AT performance, and an improved keyboard with function keys across the top.

have preferred high-res color and an Enhanced Graphics Adapter equivalent. Such things are well within Compaq's reach, but I sense the Houston company is waiting until more graphics standards emerge.

The keyboard is Deskpro-like, with soft-dome technology. There is a break-over point halfway down the key's travel, giving you gentle but definite tactile feedback. The CapsLock, ScrollLock, and NumLock keys are illuminated. Suitably oversized Shift and Enter keys are well placed. Except for the function keys, the Compaq keyboard's layout mimics the PC AT's. Compaq hasn't ignored the international market, either. An optional board plugs into the bottom of the machine to give it true automatic dual-voltage capability. The board dispenses with the jumper changing and fan switching of the older machines. All you have to do is use the right line cord.

MEASURING UP How much smaller is the Portable II? The combined measurements of 17.7 inches wide by 7.5 inches high by 13.9 inches deep make for 30 percent less volume than its predecessor. Coupled with a 17 percent weight loss, the new unit is a far more desirable traveling companion. The dual-drive machines weigh in at 26 pounds. Each and every component of the Portable II has come under scrutiny for miniaturization and weight reduction, and the effort shows.

Every time we go to COMDEX or another big computer show, the plane is invariably filled with Compaq-toting software types. In fact, it's hard to board a plane these days where there isn't at least one Compaq among the carryons. If all these machines were to magically become Portable IIs, there would suddenly be room for things like your jacket in the overhead bin. As I write this (on my Tandy Model 100), some guy's Compaq Plus perches ominously over my head and there's another one across the aisle, one row back. Some lady had to check her bulky coat as baggage because it wouldn't fit anywhere. If we hit an air pocket, it's gonna be raining computers in here.

■ The Portable II has everything you bought a computer for: graphics, disk storage, memory, speed, high-res text mode—and a handle.

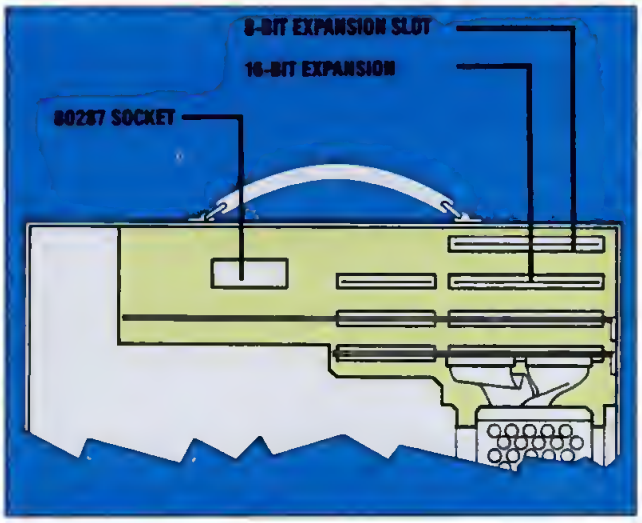
Even if it hits the deck, the Portable II is unlikely to be harmed. The case envelops the computer securely, and the sliding doors are improved over the original Portable. I'm surprised, however, that Compaq didn't seize the opportunity to engineer a more positive catch for the keyboard. The current design takes a couple of tries to fasten and has already caused more than a few broken fingernails and dropped keyboards.

The machine includes a new tilt device: A bi-fold door on the bottom locks in two positions for height adjustment. This door also affords access to the cord storage area. Frankly, it looks a little flimsy to me, but time will tell.

THE GOLEMBO EFFECT I say this machine will be a success. Why? Because it follows the precepts of the Golembo Effect. This theory was first advanced by a friend, consultant Eri Golembo, who stated, "People will buy any product that has been made smaller if it retains the functionality of the larger product and has a handle." It's been true of TV sets, typewriters—everything, in fact, except boom boxes.

It's true, too, of the Compaq Portable II. Unlike the many valiant efforts in the laptop field, this one has everything you bought a computer for: graphics, disk storage, memory, speed, high-resolution text mode—and a handle. It doesn't wimp out on readability or horsepower. It isn't snarled in a tangle of cables in order to

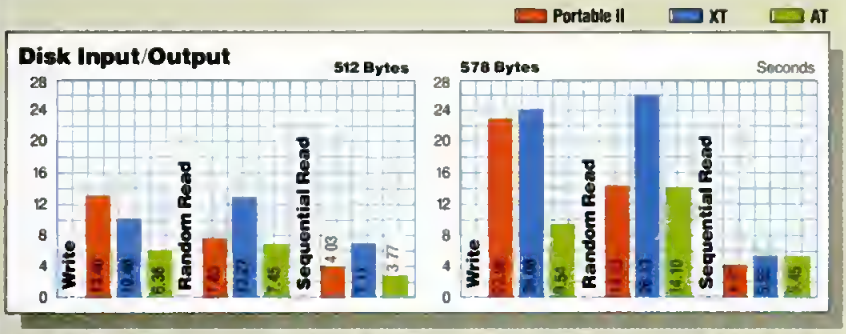
Beneath the Portable II's pretty skin is another pretty skin. Its components are fully enclosed for protection and RF control.



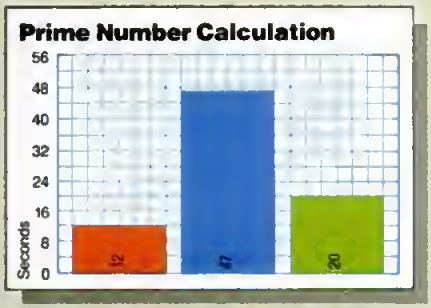
Expansion is limited to one 8-bit and one 16-bit slot, so choose your boards wisely. 80287 installation doesn't require disassembly.

PC LABS BENCHMARK

Compaq Portable II vs. IBM PC-XT and IBM PC AT



Disk Input/Output Test. This benchmark measures the time it takes to create a 200K data file using record lengths of 512 bytes and 578 bytes. The test program then does a random read of 256 records from this file, followed by a sequential read of the same records.



Prime Number Calculation Test. This benchmark measures the speed at which the computer can find all the prime numbers between 1 and 50.

Drive Access Test. Written by Core International, this benchmark measures a hard disk's seek time—the fundamental measure of how fast the drive responds to the disk controller's instructions. The figures above are averages of the time it takes to do a series of apparently non-systematically selected track accesses on each computer.

make it "compatible." It's expandable with both AT- and PC-compatible cards. It doesn't run on batteries, but then most people fail to understand that it doesn't have to.

There are distinct and separate markets for desktop and portable machines, portable/briefcase machines, and notebook computers. The last group of machines is not and need not be IBM compatible to succeed with business users. Tandy's entries are still the best examples. The middle group is optionally IBM compatible, with the Kaypro 2000 and the Panasonic Executive Partner being the best examples. The Compaq Portable II is an important addition to the first group; not only is this group the largest, but its members must offer IBM compatibility to succeed in the business market. Compaq understands all of this and doesn't have to apologize for not having produced a laptop. Remember the Golembo Effect's chief caveat: ". . . if it retains the functionality of the larger product." Laptop technology as it exists today precludes equivalent functionality.

On the one hand, the Portable II is so predictably compatible that it's almost boring. On the other hand, it's a daring departure for Compaq. The strategy that made the company a success was that of slavish replication of every IBM feature, even the bad ones. The keyboard is a shining example. The original IBM keyboard had a warty layout, faithfully duplicated by Compaq. IBM didn't get its keyboard act together until the PC AT, which Compaq took as permission to do a correct keyboard. Now we have in the Portable II a non-AT replacement machine with an AT-like layout, except for the function keys across the top. Moving the function keys was an incredibly courageous decision for Compaq, one that must have been accompanied by great corporate soul-searching. It bespeaks heretofore unheard-of corporate confidence, and it's about time.

If the Portable II isn't an AT replacement, where does it fit in? Compaq is hedging and won't admit to the machine's replacing any existing models in its lineup. The company also states that it won't cannibalize sales of other models. I think it's fairly obvious that the Portable II puts the hurt on the original Compaq Portable and the Compaq Plus. It's the machine of choice for all but the most price-sensitive buyer. It will cannibalize some existing sales of the Portable 286, but not the bulk of them. Also, Compaq is limiting the disk storage to 10 megabytes to protect the 286 market. You'll be able to buy a stripped-down version and put in your own hard disk, but it won't be easy. "Difficult, but not impossible" is how a Compaq spokesman characterized the task.

The Portable II might just encroach on some desktop PC sales, as well. It's stylish, has a small footprint, and boasts excellent performance. Besides, how many Compaqs ever get moved, anyway? The Golembo Effect points to the low end too, since this machine increases performance with the same features in a smaller package. The Portable 286 has both increased performance and more features. Its primary audience is those who need a PC AT they can take with them. The Portable II raises the performance floor of everyday computing. And it has a handle. ■

PC MAGAZINE FACT FILE

Compaq Portable II
Compaq Computer Corp.
20555 FM 149
Houston, TX 77070
(713) 370-0670
List Price: Model 1 (1 floppy), $3,200–3,300; Model 2 (2 floppies), $3,400–3,500; Model 3 (10-Mbyte hard disk), $3,600–3,900. (Suggested retail prices were not fixed at press time.)
In Short: The Compaq Portable II is a faster, slimmer portable with IBM PC compatibility and PC AT performance.

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AT&T'S WONDER BOARDS

AT&T's new Electronic Photography and Imaging Center has produced some remarkable color and graphics boards that give artists and designers a reason to rejoice.

Like the rich soil that produces new strains of Indiana corn, AT&T's new Indianapolis-based Electronic Photography and Imaging Center (EPICenter) has produced a remarkable crop of advanced technological products. Recently released, EPICenter's Truevision high-performance graphics boards and *TIPS* graphics design software are breaking new ground and attracting attention. The Truevision boards—the VDA/D, ICB, and the TARGA series—give artists/designers a higher-quality image, a tremendous increase in the number of on-screen colors, subtler color blending, and video-image capture facilities. The *TIPS* series of graphics design programs takes full advantage of these features.

To test EPICenter's claims, PC Magazine Labs put three of these boards—the VDA/D, ICB, and TARGA 16—through their paces. All three were installed with ease and performed well. The VDA/D (Video Display Adapter with Digital Enhancement) operates with the standard IBM graphics adapter or compatible. The ICB (Image Capture Board) and the TARGA 16 (Truevision Advanced Raster Graphics Adapter) replace the IBM Color/Graphics Adapter but require a monochrome monitor to display DOS operations; both the ICB and the TARGA 16 can be installed in your computer at the same time. All three boards produced wonderful color and flicker-free display on the Sony QVM monitors and the IBM Color Display that the Labs used.

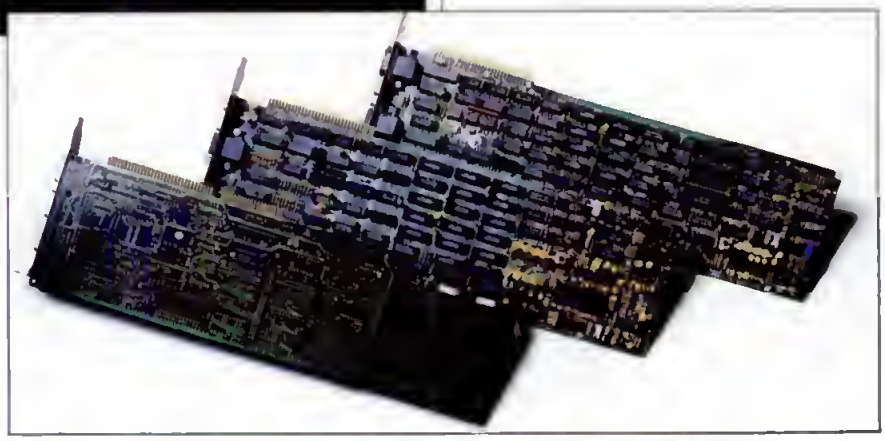
CONTINUING ACHIEVEMENTS The VDA/D and the ICB—the first two boards in the Truevision series—set the scene for the products that followed. Most notable was their ability to display television-quality images on a composite or analog RGB monitor.

The EPICenter team achieved this feat by fooling the eye. It kept the resolution low at 256 by 200 but increased the number of colors from the usual 16 per image to 256 out of a possible 32,768. When the human eye sees shading, it fills in the density. This innovation turns a PC monitor into a vehicle for videotext and still-frame teleconferencing at a very reasonable cost.

Since introducing these products, the EPICenter has continued to invent and apply new technology to computer graphics. The VDA/D, an updated VDA with "digital enhancement," now displays its 256 colors on the standard eight-color digital RGB monitor, the IBM Color Display. Thus it outperforms IBM's own new Professional Graphics Adapter and Professional Graphics Monitor, which offer 64 out of 256 colors, although at the appreciably higher resolution of 640 by 480.

EPICenter's brand new TARGA series of graphics boards takes its lead from the

With an ICB board, a composite monitor like the Sony pictured here (above right) can display up to 32,768 colors simultaneously at 256×200 resolution. Both the ICB and TARGA boards require you to have a monochrome adapter and monitor to run DOS (left); the VDA/D, the low-end board in the Truevision series, does not.



The TARGA 16 (left) and ICB (center) replace the IBM Color/Graphics Adapter. The VDA/D (right) operates in conjunction with a standard color graphics adapter.

Truevision series. The TARGA boards increase resolution to 512 by 480 and the number of colors to a whopping 16 million. Both the TARGA boards and the Truevision ICB directly capture video images and overlay stored graphics on top of live video.

EPICenter's *TIPS* graphics software, customized for the new hardware products, shows them off to best advantage. Now outside software companies are also using the Truevision series as the basis of their products (see sidebar, "Support Software for Truevision").

TRUEVISION VDA/D The Truevision VDA/D is the low-end board in the Truevision series. It displays and manipulates images and can receive electronically transmitted images sent by an ICB board or another VDA/D. The VDA/D does not capture video images directly from the source.

The original VDA was different from other graphics adapters in that it displayed images on both composite color video monitors and analog RGB monitors. The new digital enhancement, which allows the board to work with digital RGB monitors, vastly increases the color capabilities of the IBM Color Display and compatibles. (See sidebar, "Teaching Your Old Monitor New Color Tricks.")

The VDA/D is also unusual in that it can display four quarter-screen images simultaneously, each with its own unique map of 256 colors. EPICenter expects the quarter-screen images to be used for picture databases or electronic mail with images. The board can perform sophisticated pattern design and color manipulation as well.

The VDA/D also receives images created or captured with the ICB or VDA/D on one PC, then transmitted over telephone lines to another PC. At 1200 baud, transmitting a 128 by 100, 6K-byte, quarter-screen image takes only 1 minute. Three programs accompanying the VDA/D demonstrate its capabilities.

The board operates with surprising speed, owing in part to the Western Electric proprietary Video Timing Controller Chip that controls the transfer of data from the display memory to the monitor. The display memory uses Row Addressable RAM, or RARAM, which further reduces the time it takes to put the image on the screen.

Though you would usually use the VDA/D at a resolution of 256 by 200, the board also has a high-spatial-resolution mode that displays an 80-column area at 256 by 512 resolution. However, there's a trade-off: Only 15 colors are available in this mode.

The VDA/D does not replace the IBM Color/Graphics Adapter or compatible in your PC, nor does it require a second monitor. If you're using a digital RGB monitor, you can connect the CGA to the VDA/D with AT&T's Pass-Through Cable. If your monitor is analog RGB, the VDA/D

(continues on page 161)

This close-up of a normal IBM Color Display running with the Truevision VDA/D board demonstrates the board's ability to display 256 colors simultaneously. The VDA/D board uses time-variant techniques to generate 32,768 possible colors.

will take the additional step of converting the CGA's digital RGB signal to analog.

TRUEVISION ICB Like the VDA/D, the ICB displays, manipulates, and receives stored images. However, it has two additional capabilities that go far beyond the VDA/D's: It can capture and digitize video images directly from the source, and it can overlay computer-generated graphics on top of live video images.

The ICB's capture speed is impressive. Since it grabs an image in 1/60 of a second, no blurring results. The secret is its composite video decoder, which captures a standard NTSC composite video input signal and divides it into its three color components: red, green, and blue. The analog-to-digital converter then converts each of the three analog signals to a digital form. Having the capture and display logic on the same board increases the speed even further.

The Truevision ICB board allows video capture with a normal composite video input. The ICBTIPS *software lets you overlay images by defining black as transparent. In this image, we first painted the background and stored it. We then captured the author's face and painted its background black in order to use it as an overlay. Finally, we recalled the painted background and overlaid the face. The process was repeated for the hand.*

Along with its nearly instantaneous video capture, the ICB's overlay quality is a first on microcomputers. You can run a live video presentation on your PC as if it were a television, then overlay stored text or digitized video images on top of it.

Unlike the VDA/D, the ICB will not work with a digital RGB monitor; instead it requires either an analog RGB or composite color video monitor, or a color television set equipped with an RF modulator. This trade-off isn't so bad; while the VDA/D displays 256 colors at a time out of 32,768, the ICB can display all 32,768 colors simultaneously at the 256 by 200 resolution. Also unlike the VDA/D, the ICB (and the TARGA boards as well) does require you to have a second, monochrome monitor to run DOS.

The ICB package contains two little programs, ICBARTIST and ICBPUZZLE, that show off its sophisticated graphics capabilities to very good advantage. It also includes ICBCRUNCH, which compresses ICB images into the VDA/D format, and VDADECODE, which makes it possible to view quarter-screen "crunched" ICB images on a system using a VDA/D.

Support Software for Truevision

AT&T's TIPS series isn't the only graphics software that supports the Truevision boards. Several well-known third-party vendors plan to support them as well.

A graphics adapter is only as good as the software that supports it; hence many new boards languish until software developers catch up. Fortunately this is not the case with AT&T's Truevision graphics adapters. The *TIPS* image capture and paint software is already available. In addition, a number of well-established third-party graphics software developers also support the boards.

Media Cybernetics' family of 2-D graphics programs will be available for the AT&T Truevision boards under the name HALO-Vision. Essentially, this software is its already existing *Dr. HALO II* with video input capabilities and a new virtual page.

In the area of 3-D, West End Film's *Artwork* will also be available for the complete Truevision/TARGA series. This solid modeling program will offer smooth-shading features using the full palette capabilities of the AT&T boards. West End's 2-D paint program, *Brushwork*, will also run with the AT&T line. Another member of the family, the animation program *Videowork*, is slated to run on the TARGA 16.

Core Analytic is working with Royal Recovery Systems to serve some of the vertical markets. It is supporting the Truevision ICB board with *Videobase*, a relational database manager that stores and retrieves photos as well as text. Core will also offer a customized-software service called *Image Base* for the ICB, TARGA 16, and TARGA 32 boards.

Targa Systems Corporation (not to be confused with the AT&T TARGA Series) recently introduced a business presentation graphics package that supports some of the Truevision boards. Its Decision Images Presentation System comprises the Artist Creation System, the Application Development system, and the Presentation Delivery system. Each set has two or more application programs tailored to specific creative operations. The three sets include a symbol library, drawing capabilities, multiple text styles, a spreadsheet, business graphs, video input, and presentation motion and timing control. The system currently works only with the VDA/D, but support for the TARGA boards is under development.—**Gerard Kunkel**

Diary of an

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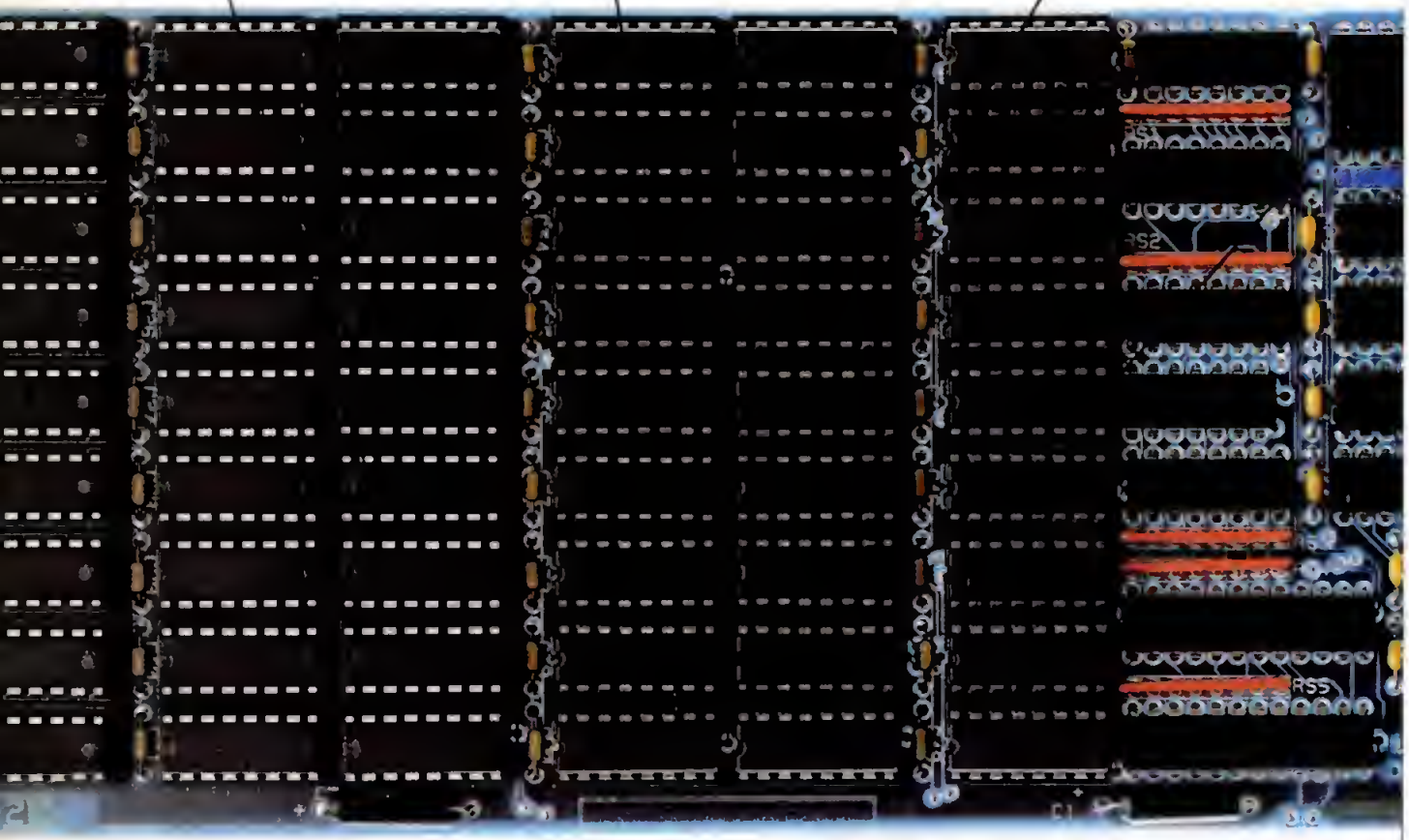

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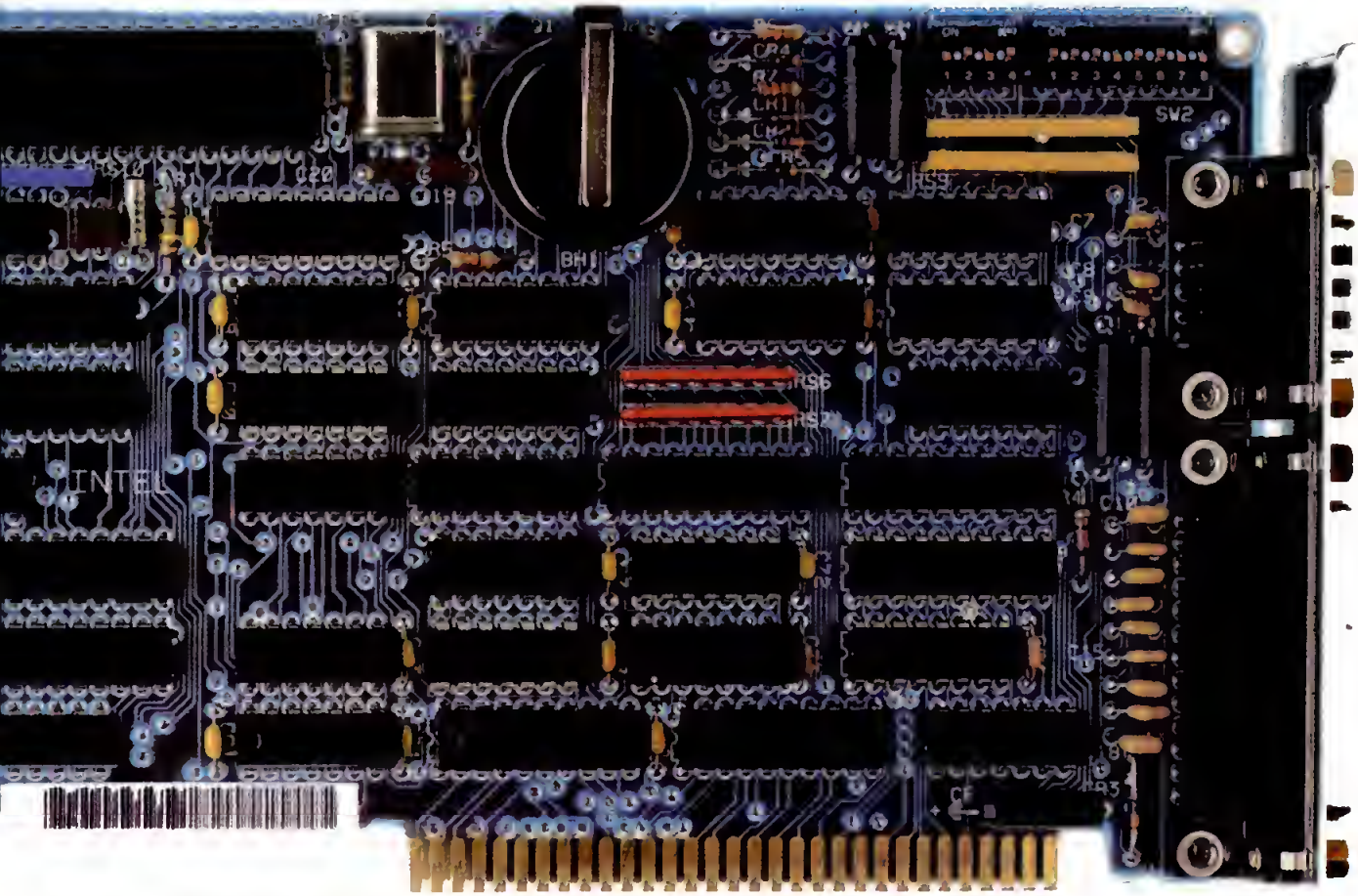

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FOUR TARGA BOARDS The four boards of the TARGA series are EPIC's newest additions to its graphics hardware line. Functionally, the TARGA boards are high-resolution, multicolored equivalents of the ICB. Their combination of video capture, 512 by 480 resolution, plentiful colors, and high speed puts them on the leading edge of the PC graphics field.

The TARGA boards are designated according to the number of bits allocated to each pixel. The TARGA 8 is a black-and-white rather than a color system. It uses 8 bits per pixel to specify 256 levels of gray. The resulting image looks like a black-and-white photograph or television picture. This system is useful when you must identify objects by shape rather than by color, as on assembly lines, in surveillance work, and in some medical applications.

■ The ICB board can capture and digitize video images directly from the source.

The TARGA 16 is the one most similar to the ICB; the functional difference is its higher spatial resolution. It manages its 32,768 colors and overlay capability by using 15 of the bits per pixel to specify color and the 16th bit to indicate whether or not the pixel is an overlay.

With its 24 bits per pixel, the TARGA 24 makes a flying leap from 32,768 to 16,777,216 colors. The 24 bits mean that red, green, and blue each have 256 levels, whereas in the TARGA 16 they're limited to 32 levels each.

The TARGA 32 uses 24 bits to specify color; the 25th is the overlay bit. The remaining 7 bits permit 128 levels of blending for live video and stored images. Thus for each pixel the total signal is divided into 128 parts, some fraction of which may come from the live video and some from the stored image. This level of control enables you to produce fine dissolves and subtle blending.

Like the ICB, the TARGA 16 board works with analog RGB monitors, composite color video monitors, and color television sets equipped with RF modulators, but not with digital RGB monitors. The TARGA 24 and 32 actually use only analog RGB input and output, but a video converter will convert composite video signals to analog and back again, so that you can use these boards with composite video inputs and outputs.

Teaching Your Old Monitor New Color Tricks

The VDA/D's digital enhancement is based on a design that's radically different from conventional technology. It lets your old IBM Color Display show more colors.

Until now, if you wanted to get more than 16 colors on your PC screen, you had to replace your IBM Color Display with a different kind of monitor. You could buy a graphics board that paints a rainbow of colors, but you'd need a color composite monitor or an analog RGB display.

Things have changed with the introduction of AT&T's Video Display Adapter with Digital Enhancement (VDA/D). By installing the VDA/D into your PC, you can display 32,768 colors without having to make room for a new monitor. (See "Monitor Terminology," *PC Magazine*, Volume 4 Number 20, page 116, for a discussion of the different types of monitors).

STORING AND GENERATING COLORS Designating a color is a two-part task: The computer first stores the definition of the color, then generates the color in the monitor.

Storing the definition of the color is the easy part. The IBM Color/Graphics Adapter, the board that usually drives the IBM Color Display, allocates 4 bits to each pixel, 1 each for red, green, blue, and intensity. Each bit can be on or off, resulting in a total of 16 colors. The VDA/D increases the number of color specification bits per pixel from 4 to 15, dropping the intensity bit, and allocating 5 bits to each of the three color components, red, green, and blue.

But why do you need 5 bits per pixel if the bit for each color is either on or off, and the associated color gun in the monitor is sending out an electron beam of either 5 volts or 0 volts? Here, the VDA/D's design radically diverges from the technology underlying the IBM Color/Graphics Adapter and similar boards.

TIME-VARIANT TECHNIQUES As Alan Wlasuk, the head engineer of AT&T's EPICenter, explains you can vary the amount of a color component in two ways. One way is to vary the voltage, so that, for instance, a red gun sending an electron beam at 1.5 volts would give a tinge of red, while at 4.0 volts the screen would display a more intense red. However, this method doesn't work well on the IBM Color Display.

The other technique, which Wlasuk's team has put to use in the VDA/D, is to vary the time interval during which an electron beam is aimed at a pixel rather than vary the voltage. When you use the Color Display in conjunction with its usual adapter, the red, green, and blue guns are aimed at a pixel for an unvarying 1/16 microsecond.

Using time-variant techniques, the VDA/D can set this time to one of several intervals. A very short time period invokes a tinge of red, while a longer one results in a stronger color. The 5 bits for the red component correspond to the lengths of time that the red gun can shoot its electron beam at a pixel. Simultaneously, the green and the blue gun are also being set and fired, causing a single pixel to emanate 1 of 32,768 colors.

Yes, you can teach an old monitor new tricks.—**Stephanie Stallings**

The TARGA series uses the full range of video sources: videodisk player, video camera with VCR or power pack, and VCR. The boards can capture composite video output from the IBM Color/Graphics Adapter, but they do not replace the adapter. Their fast processing speed makes it seem as if the more complex graphics capabilities are actually built into the boards themselves, but in reality, the zoom is the only function controlled by hardware rather than software.

The boards are packaged with a Tools floppy disk containing the software functions, plus a hard copy of the source code. Aspiring graphics software designers will find these additions useful.

Along with the boards, the EPICenter is marketing peripheral equipment so that you can put its hardware to the best use. Since an analog RGB camera produces a sharper image than a composite video camera does, EPICenter is offering a consumer-grade JVC camera with RGB and composite video output.

The EPICenter has also worked with Polaroid to produce a specially modified version of the Polaroid Palette Screen camera. Called the Truevision Film Printer, this camera is tuned to the TARGA color range and can produce slides or prints.

TIPS SOFTWARE All this great hardware needs great software; hence, the *TIPS* graphics design software—produced by EPICenter in collaboration with Island Graphics.

As much as possible, all *TIPS* packages share the same menu format. Of course, underlying the similar interfaces, the packages for the specific boards are different. Not surprisingly, the greatest difference in format and functionality is between the *TIPS* package for the VDA/D, where *TIPS* stands for *Truevision Image Paint Software*, and the *TIPS* packages for the ICB and the TARGA series boards, where *TIPS* stands for *Truevision Image Processing Software*.

All the different versions of *TIPS* share certain general features. The main menu is a pop-up grid of squares that allocates each horizontal row to a functional submenu such as drawing, brushes, or patterns. Each row holds icons of that particular submenu's most frequently used functions. This setup is like having your most often used brushes and paints laid out next to your easel. When you need other tools, you can replace the main menu with a full submenu showing all the possible functions.

Another universal characteristic of *TIPS* consists of attributes that further define a function. The Filled attribute, for instance, indicates whether a figure will be drawn in outline form or filled in with a color. By choosing a particular Point attribute, you determine which fixed points you will use to draw a figure.

Attributes can also specify the points of connection in a series of repeated figures. Not every function uses every attribute, but since the meaning of the attributes is consistent throughout the program, the functions operate consistently as well. Most of the submenus and attributes are independent of one another, so that you can easily mix and match them, effectively multiplying the available functions.

TIPS FOR VDA/D *TIPS for VDA/D* brings you the full power of the VDA/D board. The main menu does not display the full palette of 256 colors; instead it shows two bars of 8 colors each as windows over the larger palette. One bar contains your choices for the drawing color or pattern, and the other contains the available background colors. This format enables you to work with a group of colors without having to go back and forth from the color submenu.

The *TIPS for VDA/D* drawing functions, while not unusual, have some interesting attributes. The Line function lets

The TARGA 16 board is most notable for its ability to capture and display 32,768 colors. To create the image on the top left, we captured live video and overlaid it on a painted background. Details of this image show a close-up of an edge softened with the TARGA TIPS *Blend function (top right), a character blended into the background (bottom left), type without the antialiasing option (bottom center), and antialiased type.*

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you draw chains in which the end of one line is the beginning of the next or create rays in which all the lines are forced to start from a single hub. The Move function's Stretch attribute enlarges an image vertically and/or horizontally. The Tile attribute in the Clone function allows you to lay down a repeating pattern of an image and store it in memory without showing it on the screen, draw over the seemingly blank area, then recall the underlying pattern in areas where you want it.

The "touch-up" menu for pixel-level editing operates as a minicanvas. While remaining in this one menu, you can select an area to edit and choose a current color from the canvas or the palette. Like the touch-up menu, the "pattern edit" menu allows you to change colors without having to call up a separate color menu or palette. You can also rotate the pattern, flip it, and multiply a small image four or eight times to create a repeating pattern.

Text handling is just as flexible. You can specify type size, rotate letters, write on an angle, and antialias text. (Antialiasing is a technique that tricks the eye into believing that a jagged line is smooth by varying the pixel intensity.)

The color menu gives you the choice of any of the three color-mixing systems. As an alternative to mixing a color, you can choose a color from your canvas, but if you change this color, all the same-colored pixels on the canvas will change also.

Additional features include an undo command that cancels all the changes since the last appearance of the main menu, a spray brush, and a Mirror function that symmetrically repeats an image horizontally and/or vertically.

TIPS FOR ICB AND TARGA Using the *TIPS for VDA/D* software is nice, but playing with the *TIPS* versions for the ICB *(ICBTIPS)* and for the TARGA series boards *(TGATIPS)* is even more fun than fingerpainting on the wall when your mother isn't looking. These offer so many functions with so many attributes that the possibilities for creating and manipulating images seem endless.

The EPICenter, in conjunction with Island Graphics, has used the attributes to include every conceivable manipulation. The Three Points on Circumference attribute helps you draw circles whose perimeters just touch. The Two Cycle attribute ensures that the last two points of a geometric figure coincide with the first two points of the next figure of the same type. The Repeat attribute draws a figure repeatedly using the attributes you've chosen.

Nifty as these attributes are, their uses are not always immediately clear, and the program doesn't clearly inform you ahead of time (before you make your choice) when two attributes or two functions aren't intended to work together.

One of the most interesting functions is the Framed Move, which has as many features as some simple paint programs. This one function lets you box off an area; move, rotate, and stretch it; paint within it; and make all the black portions of the area transparent.

■ The ICBTIPS and TGATIPS graphics packages offer endless possibilities for creating and manipulating images.

From the text submenu, you can give text black or translucent drop shadows, then antialias the letters and the shadows. One problem with the Text function, however, is that although you can reduce the size of the letters, you cannot enlarge them beyond the confines of the submenu box.

The special-functions menu offers some really outstanding features. The Mosaic function averages the colors of the pixels within the block you specify, producing a softly blurred image or a blocky one, depending on the attribute you select. By progressively blurring images and overlaying them, you can create the illusion of great depth. The Perspective function lets you put an area into perspective along a horizontal or vertical axis, and Slide lets you reposition an area horizontally or vertically.

A nifty function on the special effects menu is Cycle Draw, which causes the colors to change automatically as you draw. You can determine the range of colors that make up the cycle, and you can set the rate at which the colors change. The Spread function smoothly blends the selected colors vertically or horizontally. Other special-effects functions let you blend images to soften them or tint an entire image as though you were laying a sheet of tinted glass over it.

The easy-to-use brush and pattern menus operate similarly. You can design, edit, and save both brushes and patterns, and you can grab areas of the image to use as a brush or pattern.

Like the *TIPS for VDA/D* manual, the *ICBTIPS* and *TGATIPS* manuals are straightforward and thorough. In addition to the written tutorial, AT&T's EPICenter has wisely included sample procedures for many functions.

MORE SOFTWARE You can further enhance the images you create with the VDA/D and ICB boards by using *Truevision PC Carousel Presentation Software*. This package automatically presents you with a series of images according to the order and timings you've previously set. A choice of wipes, such as curtains, spirals, and fades, adds variety to transitions from one image to the next.

After designing images on the VDA/D or the ICB, you can display them simultaneously on your own screen and at a remote location using the *Truevision Still-Frame Teleconferencing Software (STS)* and your telephone line. *STS* will cause any operations you do at your local PC, such as changing images and pointing with the cursor, to appear on the other screen. If your PC is equipped with an ICB, you can capture live video images and send them immediately to the other screen.

According to EPICenter, the company developed the TARGA series in response to users' comments on the Truevision series of ICB and VDA boards, and it intends to use the same successful approach for designing its next line of hardware. That line will probably include a TARGA board with 1,024 by 1,024 resolution.

It's clear that AT&T intends to lead the market in PC graphics, and equally clear that the EPICenter team has the expertise and the vision to do it. ■

FACT FILE

AT&T
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Indianapolis, IN 46219
(317) 352-6120

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Truevision Video Display Adapter with Digital Enhancement (VDA/D)
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Truevision Image Capture Board: (ICB)
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Monitors: analog RGB, composite video, or color television with RF modulator
Video Sources: video camera with VCR or power pack, VCR, or videodisk player
Resolution: 256 × 200
Colors: 32,768 simultaneously
In Short: The ICB board captures live video images and overlays stored images onto live video.
CIRCLE **699** ON READER SERVICE CARD

TARGA 8
List Price: $2,295
Monitors: monochrome composite video or black-and-white television with RF modulator
Video Sources: video camera with VCR or power pack, VCR, or videodisk player
Resolution: 512 × 480
Colors: 256 levels of gray
In Short: The TARGA 8 board works on black-and-white systems, captures live video images.
CIRCLE **698** ON READER SERVICE CARD

TARGA 24
List Price: $3,995
Monitors: analog RGB, composite video, or color television with RF modulator
Video Sources: video camera with VCR or power pack, VCR, or videodisk player
Resolution: 512 × 480
Colors: 16,777,216 simultaneously
In Short: Captures live video images.
CIRCLE **696** ON READER SERVICE CARD

TARGA 16
List Price: $2,995
Monitors: analog RGB, composite video, or color television with RF modulator
Video Sources: analog RGB, video camera with VCR or power pack, VCR, or videodisk player
Resolution: 512 × 480
Colors: 32,768 simultaneously
In Short: The TARGA 16 captures live video images and overlays stored images onto live video.
CIRCLE **697** ON READER SERVICE CARD

TARGA 32
List Price: $4,995
Monitors: analog RGB, composite video, or color television with RF modulator
Video Sources: video camera with VCR or power pack, VCR, or videodisk player
Resolution: 512 × 480
Colors: 16,777,216 simultaneously
In Short: Captures live video images, overlays stored images onto live video, 128 levels per pixel of blending live video and stored images.
CIRCLE **695** ON READER SERVICE CARD

TARGA RGB Camera
List Price: $1,295
In Short: RGB and NTSC composite video camera for use with TARGA boards.
CIRCLE **694** ON READER SERVICE CARD

Truevision Film Printer
List Price: $2,500
In Short: Modified version of Polaroid Palette for use with TARGA boards.
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SOFTWARE

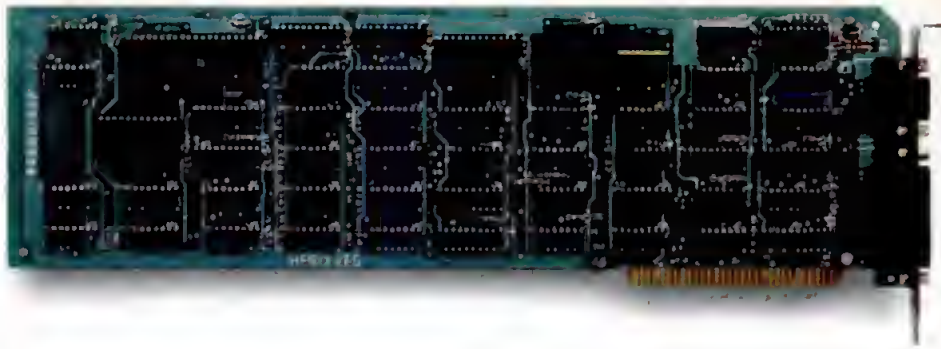
Truevision Image Paint Software (TIPS for VDA/D)
List Price: $250
Requires: 512K RAM; two disk drives; DOS 2.0 or later; AT&T's Truevision Video Display Adapter with Digital Enhancement (VDA/D); AT&T mouse, Microsoft mouse (bus version), or Summagraphics 961 or 1201 digitizing tablet.
In Short: *TIPS for VDA/D* graphic design software works with the VDA/D board to create and display images.
CIRCLE **693** ON READER SERVICE CARD

Truevision Image Processing Software for the AT&T Truevision Image Capture Board (ICBTIPS)
List Price: $695
Requires: 512K RAM; two disk drives (hard disk recommended); DOS 2.0 or later; AT&T's Truevision Image Capture Board (ICB); AT&T mouse, Microsoft mouse (bus version), or Summagraphics 961 or 1201 digitizing tablet.
In Short: *ICBTIPS* graphic design software works with the ICB board to capture and digitize video images, create and display images, and overlay stored images onto live video.
CIRCLE **692** ON READER SERVICE CARD

Truevision Image Processing Software for the AT&T Truevision TARGA boards (TGATIPS)
List Price: $1,250
Requires: 512K RAM; two disk drives or hard disk; DOS 2.0 or later; an AT&T Truevision TARGA board; AT&T mouse, Microsoft mouse (bus version), or Summagraphics 961 or 1201 digitizing tablet.
In Short: *TGATIPS* graphic design software works with the TARGA 16, 24, and 32 boards to capture and digitize video images, create and display images, and overlay stored images onto live video.
CIRCLE **691** ON READER SERVICE CARD

Truevision PC Carousel Presentation Software
List Price: $150
Requires: 256K RAM; two disk drives (hard disk recommended); DOS 2.0 or later; AT&T's Truevision Video Display Adapter with Digital Enhancement (VDA/D) or Image Capture Board (ICB); AT&T mouse, Microsoft mouse (bus version), or Summagraphics 961 or 1201 digitizing tablet.
In Short: *PC Carousel Presentation Software* lets you organize images created with the VDA/D or ICB boards into a polished slide show.
CIRCLE **690** ON READER SERVICE CARD

Truevision Stillframe Teleconferencing Software (STS)
List Price: $695 per site
Requires: Both sending and receiving computers require 384K RAM; two disk drives (hard disk recommended); DOS 2.0 or later; AT&T's Truevision Video Display Adapter with Digital Enhancement (VDA/D) or Image Capture Board (ICB); Microsoft mouse (bus version), or Summagraphics 961 or 1201 digitizing tablet; modem.
In Short: *Still-frame Teleconferencing Software* sends images over telephone lines to make them available real-time for discussions or presentations.
CIRCLE **689** ON READER SERVICE CARD



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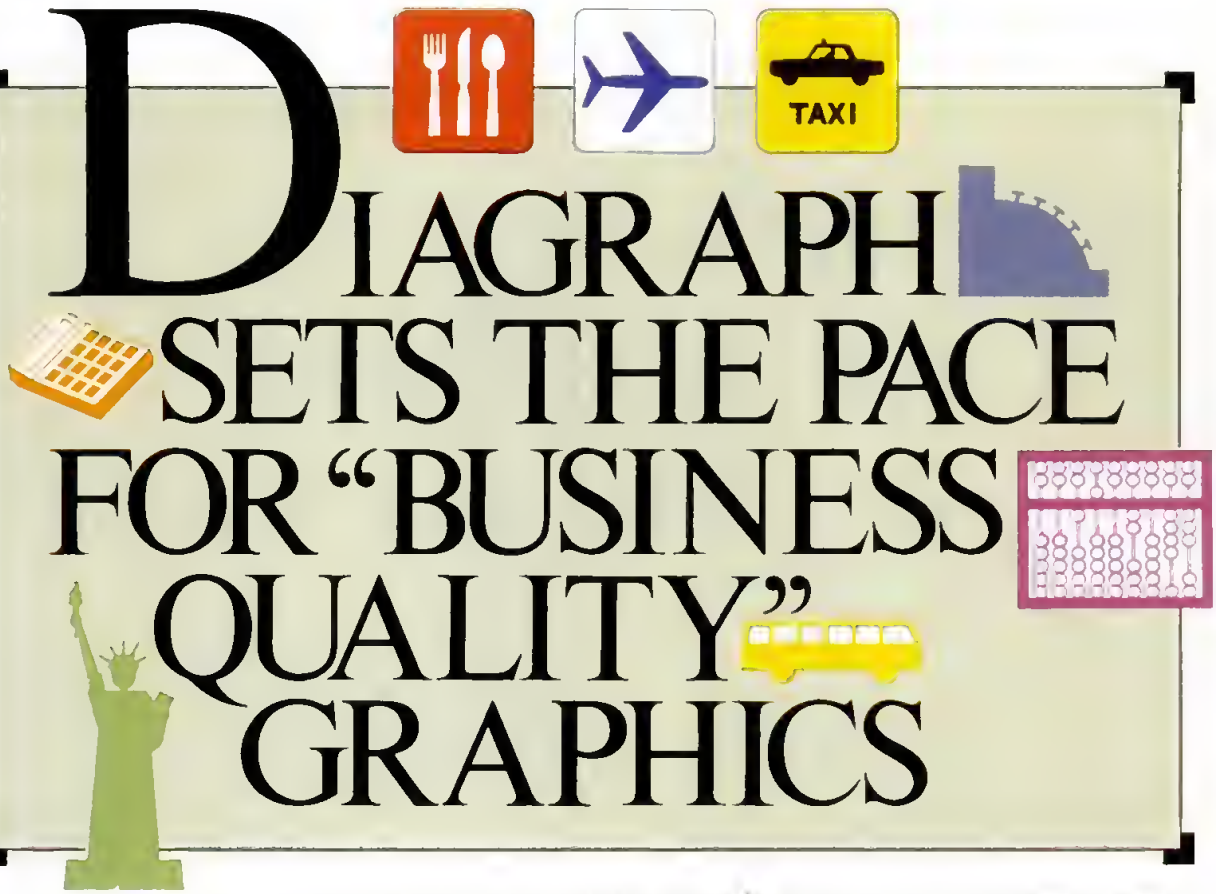
DIAGRAPH SETS THE PACE FOR "BUSINESS QUALITY" GRAPHICS



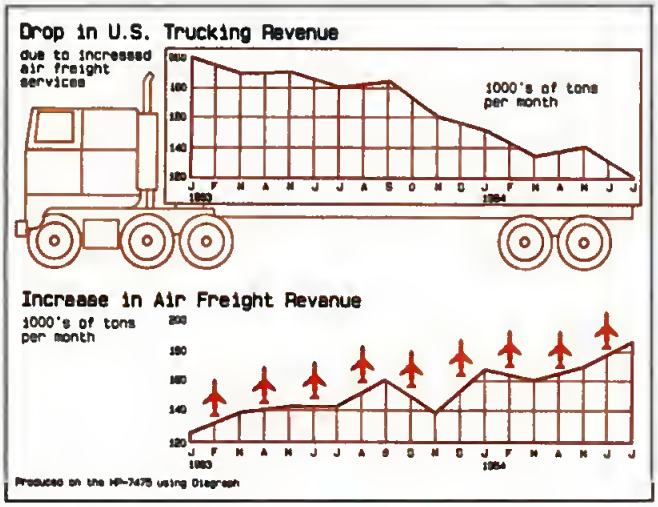
With its enormous, ever-growing symbol library and powerful graphics editor, Diagraph from Computer Support Corp. faces little direct competition. But if you want to import spreadsheet data, you'll have to look elsewhere.

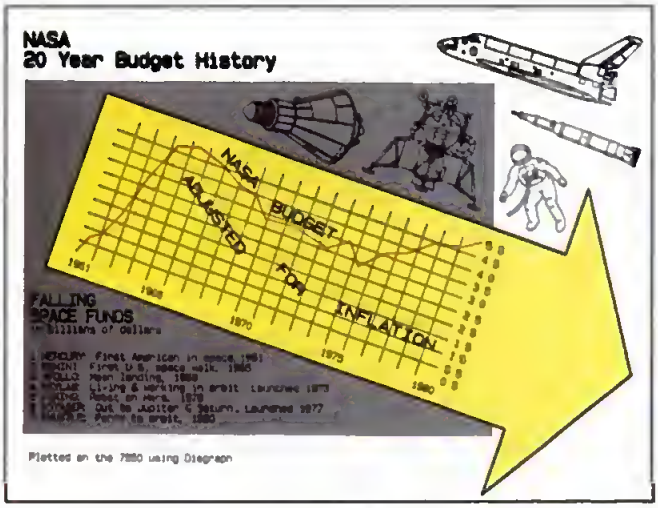
In the crowded PC graphics marketplace, the catchphrase of the day—spreading more rapidly than *user-friendly* and *natural language interface*—is *business quality*. This phrase is used indiscriminately by graphics software manufacturers, but it conveys real meaning to business users who need to know if the graphics software they are buying will give them the high-quality, professional-looking results they need.

Computer Support Corp. (CSC) of Carrollton, Texas, designed *Diagraph*, its business graphics program, with clear insight into the requirements of business graphics users. *Diagraph* is essentially a symbols library with image-manipulation, text, and line-drawing capabilities. The charts and diagrams it generates are professional enough to be used for reports and presentations.

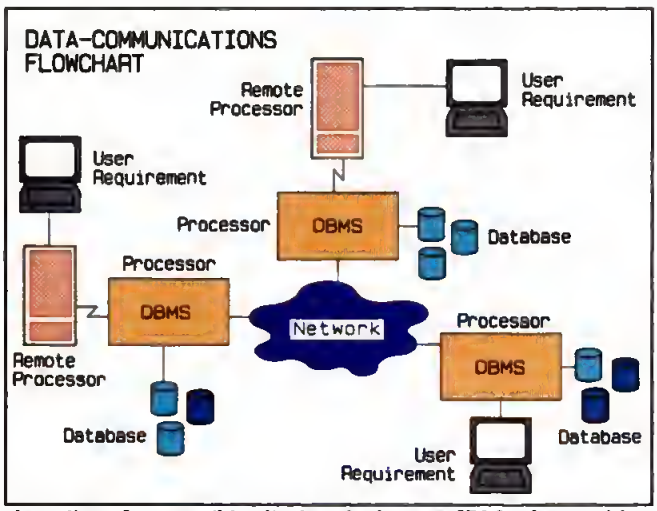
Diagraph's best features are its powerful graphics editor and large library of predefined symbols and text fonts. You can design intricate presentation figures with ease. The program has a simple, natural user interface, requiring little instruction to operate.

Diagraph faces little direct competition in the business graphics marketplace. The program most similar to it, Decision Resources' *Diagram Master* (see "When Good Form Matters," *PC Magazine*, Volume 4 Number 25), is limited by a lack of suitable display devices as well as a less sophisticated graphics manager and a poor-quality library of object symbols. IBM's *PC Storyboard* (see "PC Storyboard: Business Graphics Get Moving," *PC Magazine*, Volume 4 Number 22) is similar to *Diagraph* in that it provides a symbol library, but it, too, is limited by its





The dedicated applications section of Diagraph*'s symbol library contains the ingredients for flow charts, organizational diagrams, and pie, bar, and line charts.*



short list of compatible display devices, and its output is not as professional-looking as *Diagraph*'s. *PC Storyboard* does, however, have a big advantage over *Diagraph:* It can import spreadsheet data, while *Diagraph* cannot. A companion product from CSC, *Picture Perfect*, handles that function; *Diagraph*, according to CSC president Fred Schoeller, is "picture driven, not data driven."

Diagraph was originally developed for the Hewlett-Packard 150 and recently converted for use on the IBM family of personal computers. To CSC's credit, most of the positive features of the Hewlett-Packard version have been retained. For example, you can always see your available options by glancing at the function key descriptors at the base of the screen—a holdover from the Hewlett-Packard touch screen that works well on the PC. *Diagraph* runs with various graphics adapters, but I obtained the best results using the Hercules card in monochrome mode. It is resolution, not color, that plays the biggest role with a program like *Diagraph*. Standard IBM color graphics are not desirable with a four-color CGA palette but are quite acceptable in the CGA's monochrome mode. EGA fans will be pleased by *Diagraph*'s color and resolution on their displays.

It also helps to equip your machine with an 8087 coprocessor. Sophisticated vector-oriented graphics exact a stiff penalty in computational overhead. Programs of this type tend to be lightning fast when used with an 8087 and grindingly slow without it. Even without the math coprocessor, *Diagraph* is fast, especially when you consider the number of complex transformation, translation, and scaling operations it performs as a matter of course. But if you want to take full advantage of this program, you'll need to install an 8087.

CLIP ART At the heart of *Diagraph* is an extensive symbol library that provides photo-ready artwork at the touch of a function key. In its off-the-shelf form, *Diagraph* comes with over 2,200 intricate objects, divided into four main areas: Graphic Aids, Signs and Icons, Pictorials, and Applications. The symbols represent a wide range of objects from graphic aids, banners, and two- and three-dimensional geometric primitives to cruise ships, factories, and landscapes. The vast array of instructional and humorous symbols is

PC MAGAZINE FACT FILE

Diagraph
Computer Support Corp.
2215 Midway Rd.
Carrollton, TX 75006
(214) 661-8960
List Price: $395
Requires: 384K RAM, two floppy disk drives or a hard disk drive, graphics card (supports Hercules, Tecmar, IBM CGA, and IBM EGA), DOS 2.0 or higher.
In Short: *Diagraph*, a "picture-driven" business graphics program, does not import spreadsheet data but does let you create professional-looking presentation graphics using its extensive symbols library.

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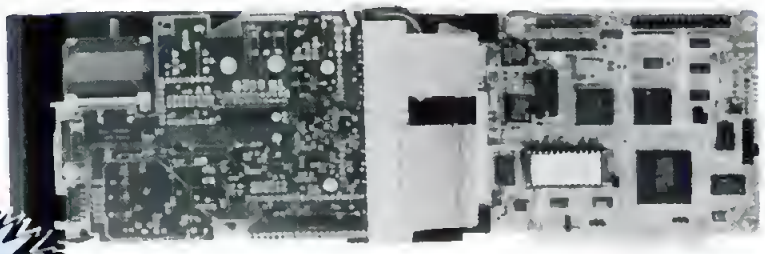

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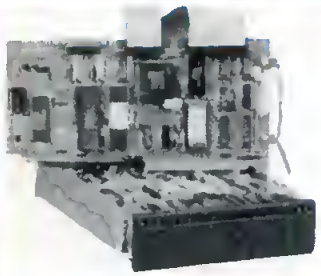

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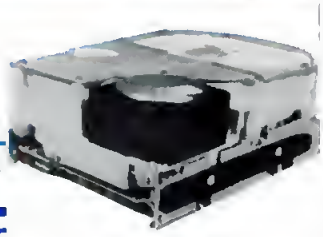

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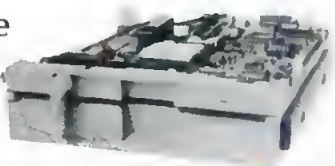

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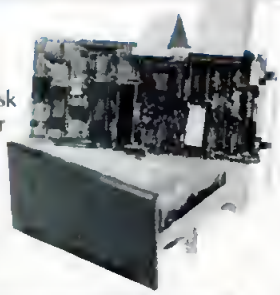

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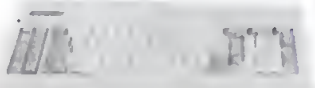

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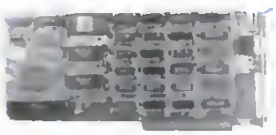

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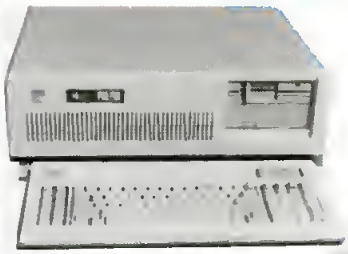

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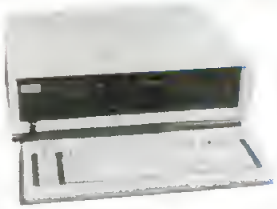

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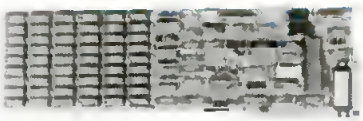

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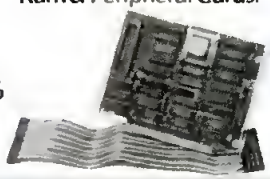

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likely to include something suitable for just about any application.

An important adjunct to the basic library is a dedicated applications section that contains high-quality data processing and communications flowchart objects, organizational diagrams, and pie/bar/line chart figures. CSC also offers 11 additional libraries containing some 1,370 symbols. These include such specialized titles as Electronics and Logic, Vehicles and Heavy Equipment, and—a personal favorite—electronic data processing (EDP) equipment. The additional libraries range in price from $59 for the Holidays and Seasons library to $129 for the highly specialized Chemical and Petroleum Process Flow library. According to Fred Shoeller, the company is continually adding to the symbol libraries.

■ On a PC equipped with 512K bytes of RAM, a single Diagraph diagram can contain around 500 symbols at the same time.

Diagraph comes on six disks, three of which contain the basic symbol libraries. Because of the sheer size of these libraries, a hard disk is recommended. Unfortunately, an irritating key-disk copy-protection scheme requires that the CSAM (Computer Support Application Manager) application disk be used to start *Diagraph* every time it is run. Installation onto the hard disk is simple, and *Diagraph* won't clutter your subdirectories with a lot of library names, as do other popular programs.

One of the six disks is a lesson disk containing many sample figures and exercises. Although CSC relies on these lessons to teach *Diagraph*, I found them relatively unnecessary for most common operations. The back of the manual lists the contents of the symbol library and has a quick topical index of function keys.

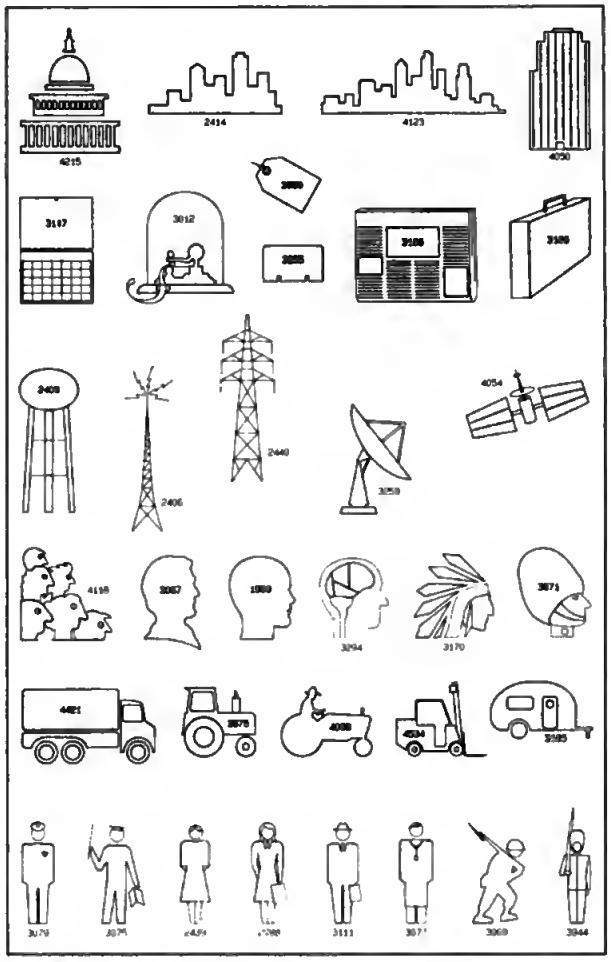
FUNCTION KEYS

Function keys are used to navigate through a hierarchical graphics manager that allows you to do things such as add or change a symbol on the screen, draw lines, and create text. Objects and text can be scaled slowly (with fine precision) or rapidly, rotated, or translated in any conceivable manner.

The function keys have different assignments at different hierarchical levels. To avoid the confusion that would normally ensue, the current assignments are displayed at the bottom of the screen at all times. These descriptors virtually eliminate the need for templates or on-line help, which is available anyway via the F7 key.

Symbols are referenced in the manual with a four-digit number. For instance, the Boeing 727 under Pictorials is number 4106. This number is used when adding or changing symbols on-screen. You hit the F3 key (labeled "Specify Symbol"), enter the number in the option row that appears on the top of the screen, and end with the F8 (Done) key. If you strike the F1 (Add) key at this point, the image will appear on the screen at the point at which the cursor is positioned. On a PC equipped with 512K bytes of memory, a single diagram can contain around 500 symbols at the same time.

A flashing box surrounds a symbol selected for manipulation. This active symbol can be changed using the cursor keys or a function key, though occasionally how this works isn't obvious. Among the more sophisticated graphics functions are the abilities to move, size, and rotate objects. When sizing, the F1 key (at the level labeled Proportional Symbol) can be used at any time to modify the object's aspect ratio so that it is not distorted along either axis.



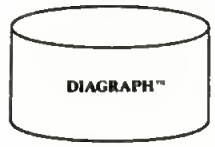
Diagraph's *basic library contains over 2,000 images that you can mave, size, rotate, shade, and combine to create impressive presentations and reports.*

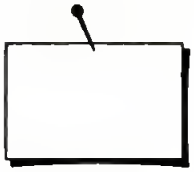
Most objects can be shaded with 1 of 45 shading patterns. For example, the clothing of an army private could be densely shaded with green. The shading color and pattem are selected or changed in the "select/change symbol" option menu at the top of the screen. Objects can also be flipped about the *y* axis (upside down) or the *x* axis (mirrored) to completely alter their orientation.

Each symbol has associated nodes that lie on its surface at logical points. These nodes are used as line endpoints for creat-

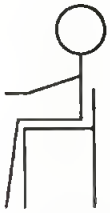
BEWARE!

Not all symbols are created equal.





Diagraph™ vs. Freelance™ & Diagram-Master™	Diagraph ver. 3.3	Freelance	Diagram-Master
High-resolution graphic art symbols	**Yes**	No	No
Number of symbols/diagrams included	**2,195**	**350**	**195**
Rotate any symbol	**Yes**	**Yes**	No
Change symbols without deleting and adding	**Yes**	No	No
Full-screen support of the IBM 3270 PC/AT	**Yes**	No	No
Window text inside a symbol	**Yes**	No	No
Number of optional symbols	**3,000**	**0**	**0**
Forms generator included	**Yes**	No	No
Connectors stretch when symbol moved	**Yes**	No	No
International characters supported	**Yes**	No	No
Supports plotters, printers & film recorders	**Yes**	**Yes**	**Yes**
Character sizes from .01 to 36 inches	**Yes**	No	No
Smooth, fully-formed typefaces (all devices)	**Yes**	No	No
Supports 8087/80287 math coprocessor	**Yes**	**Yes**	No
Align text & symbols (top/bottom/left/right)	**Yes**	No	No
Company logos available	**Yes**	No	No
Supports Tecmar Graphics Master in high-res.	**Yes**	No	No
Custom libraries available	**Yes**	No	No
Insert tokens anywhere when drawing lines	**Yes**	No	No
Stretch text in any direction	**Yes**	No	No
10 presentation-quality optional typefaces	**Yes**	No	No
Suggested retail price	**$395**	**$395**	**$345**



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Diagraph, the best selling graphics product distributed by Hewlett-Packard, is now available for the IBM PC/XT/AT and IBM compatibles.

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The competition uses arcs and lines to draw their symbols and cannot duplicate a simple ellipse, as illustrated by the disk storage symbol shown at the right above. When arcs are substituted for complex curves, symbols appear crude or misshapen.

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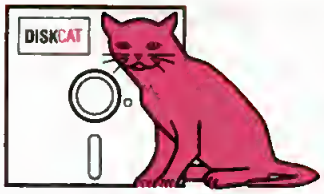

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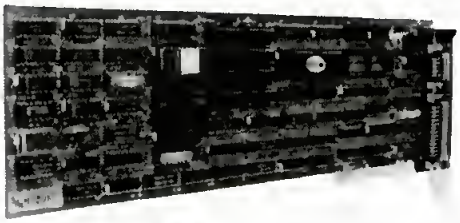

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CIRCLE 524 ON READER SERVICE CARD

ing lines or connecting symbols, or as reference points for text functions. CSC has gone to great lengths to place default nodes in logical places. Examining text nodes on the IBM PC AT symbol reveals a text node dead-center in the display. This facilitates text entry on the screen of the AT image.

The nodes themselves look like small ovals when selected and are chosen by using the cursor keypad in the line-drawing or text sections. As a result, moving objects around the screen simultaneously moves the attached text or lines. Nodes can be moved anywhere on the screen, and new nodes can be created for a symbol.

ENTERING AND MANIPULATING TEXT A crucial aspect of any presentation-quality graphics system is the ease of text manipulation and the caliber of the character sets. *Diagraph* delivers in spades, with 13 different text fonts and modes for bold, italicized, and filled text. You can rotate, size, or move text in the same manner you move symbols.

You enter the text menu by pressing F6 (Text Menu). Once you select a symbol, you can choose a text node to operate on and then edit or add text by pressing F1 (Text Menu). The screen dissolves into a dedicated text entry mode, with the upper two-thirds of the screen dedicated to the actual text area. Text is then entered line by line, with dedicated attributes available for each line such as size, color, justification, font, bold, and italics. Only an altered attribute need be set for each line. Current attributes are preserved and the bottom menu allows for character fill and spacing.

A nice feature is the ability to align text. You simply select the reference text node and adjust the active text accordingly. You can also align symbols, although this function is not nearly as useful.

Line drawing is available, and it is useful mainly to connect symbols. *Diagraph* has a simple set of drawing tools, unlike more sophisticated freehand drawing programs. You can connect nodes between symbols or draw in a free-form manner originating from any node.

Your output can be sent to a variety of supported devices, including a dozen or so plotters, laser printers, dot matrix printers, and film recorders. I used a Hewlett-Pack-

ard 7550A plotter for the output reproduced and achieved excellent results on both paper and transparencies. A high-resolution output device such as a plotter is virtually a requirement for producing photo-ready figures. Plotting and printing options are set in the *Diagraph's* Plot section. I had no trouble whatsoever navigating through the output options menu, which includes such choices as frame border and pen size. To speed up plotting for rough drafts, you can turn off time-consuming advanced output features such as shading. However, I quickly lost the habit of doing rough drafts at all.

Aside from providing prompt and reliable support, CSC offers a number of useful and rare auxiliary services that range from the development of corporate logos to generating entire libraries of custom symbols.

Diagraph has few drawbacks. A hidden-line removal algorithm would be a nice enhancement, allowing you to achieve depth perception though multiple display planes. This feature, however, is extremely advanced; it normally appears only in expensive CAD software. On a more basic level, the lack of a zoom function—in or out—is one limitation that should be addressed. Complex and sprawling figures can often run out of room on the screen, requiring extensive resizing of individual objects. A zoom function would solve this problem without imposing additional design responsibilities on the user.

Diagraph does not support any additional input devices such as a mouse or light pen. This is not quite as much of a limitation as it first appears to be, since you really don't need to do an excessive amount of drawing.

GO WITH THE FLOW One way to measure a program's ease of use is by how difficult it is to fall back into the flow—without the assistance of a manual—after not using the program for some time. *Diagraph* passes this test with flying colors. You should have little trouble learning to use it or retaining the knowledge.

Diagraph is fast, polished, and chockfull of high-quality material suitable for the most discriminating user. It gives any presentation or publication a professional look. For advertisers, business people, artists, or just about anyone who wishes to convey a message in a concise and effective manner, *Diagraph* is a tool well worth the investment. ■

Russell Carroll is the president of Phoenix Numeric, a computer consulting firm. He is the former vice president of Digital Productions.

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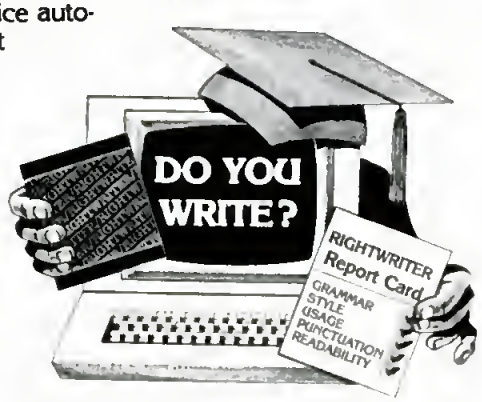

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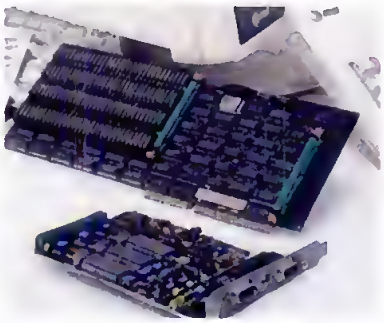

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Hard Disk Cards

Since the introduction of Plus Development Corp.'s Hardcard last fall, new hard disk cards have been flowing into PC Labs at the rate of about one a month. Compared with the original—and with the XT's built-in hard disk—there's more good news than bad.

AN EXPENSIVE SOLUTION WORTH CONSIDERING

As manufacturers of expanded memory boards, tape backup drives, and accelerator boards can testify, it often takes years after a new hardware category is introduced before the public develops a corresponding need. Not so with hard disk cards, those add-in Winchester disks that slip into an expansion slot in seconds. Though the cards have been available for only a few months, consumers who had postponed the hard disk plunge are now flocking to this particular option.

The products have been given a dramatic advertising push. "Hardcard can save 2,500,000 PCs from an untimely end" blazes the headline atop a pen-and-ink sketch showing a graveyard full of computers. The message is simple: The one thing that stands between these machines and obsolescence is Plus Development's Hardcard.

Like many advertisements, this one is only selectively accurate. Installing a hard disk in a PC can be accomplished quite nicely and inexpensively using time-honored upgrade methods, even if the existing drives need to be tossed in favor of a pair of half-heights. The fact is, a hard disk card can still be more expensive.

To see the enthusiasm that has greeted Plus and other hard disk cards, however, one would never know that it is still a relatively costly way to add megabytes. Their greatest plus, in fact, is that they are ridiculously simple to install and use.

This simplicity of installation is what may justify, for some us-

Plus Development's streamlined Hardcard is only 1 inch thick. The tiny 3½-inch hard disk is hermetically sealed in a metal chamber covered with black plastic.

ers, the high cost. Card disks let you dispense with the services of a skilled hard disk installer, whose astronomical hourly rates add considerably to a conventional add-in's cost for the mechanically incompetent. A hard disk card offers you the best of two worlds: ease of installation and use and a hobbyist's sense of accomplishment when you install it yourself.

POPULAR CLONE Plus Development, a start-up company, was the first to reach the market with a hard disk card (see "The Hardcard: A 10-Meg Marvel," *PC Magazine*, Volume 4 Number 25). It soon became apparent that this could become 1986's most-likely-to-be-cloned product.

Close on Plus's heels, Mountain Computer was the next to ship hard disk cards in quantity. At first, the 10-megabyte Plus Hardcard seemed to have the upper hand, with its sharp looks and aggressive advertising campaign. Mountain began shipping two versions of its DriveCard—10 and 20 megabytes, with a price difference of $100—in fall 1985. By year's end Mountain was manufacturing and shipping 1,000 cards a week—all but a fraction in the 20-megabyte size.

Several hard disk cards were announced at the fall 1985 COMDEX, and at least six companies were shipping them by the first few weeks of 1986.

PC Magazine Labs tested five hard disk cards: The Plus Hardcard, Mountain's DriveCard, Western Digital's FileCard, Tandon's Diskard 21, and the Sysdyne! Products PHD (Portable Hard Disk) System. All were subjected to the Labs' battery of hard disk tests to measure access time and disk I/O efficiency. We identified three other available hard disk cards, from Microscience International, Systems Peripherals Consultants, and JVC; these companies would not send us their products in time for this review. The JVC product is basically the same drive as the one distributed by Western Digital, with Western adding interfaces for second drives and

PC MAGAZINE EDITOR'S CHOICE

*Tandon's **Diskard 21** is the hard disk card of choice, because of its price and capacity—$995 for 21 megabytes—and its ability to fit in the PC's end slot with no speaker relocation. This recommendation must come with some reservation, because each of these products has something to recommend it over its competition. The Diskard does not have an access indicator. It lacks the speed and sleek size of the Plus Hardcard, the added value of Western Digital's FileCard, and the flexibility offered by Sysdyne!'s versatile PHD. Still, the cost per megabyte makes it the best value of the first wave of hard disk cards.*

PC MAGAZINE FACT FILE

Hardcard
Plus Development Corp.
1778 McCarthy Blvd.
Milpitas, CA 95035
(408) 946-3700
List Price: $1,095
In Short: The first on the market, Plus's Hardcard is the thinnest and fastest hard disk card tested.
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DriveCard
Mountain Computer
360 El Pueblo Rd.
Scotts Valley, CA 95066
(408) 438-6650
List Price: $1,195 (20 MB); $1,095 (10 MB)
In Short: The DriveCard is a conservatively designed but efficient hard disk card with no outstanding features.
CIRCLE 662 ON READER SERVICE CARD

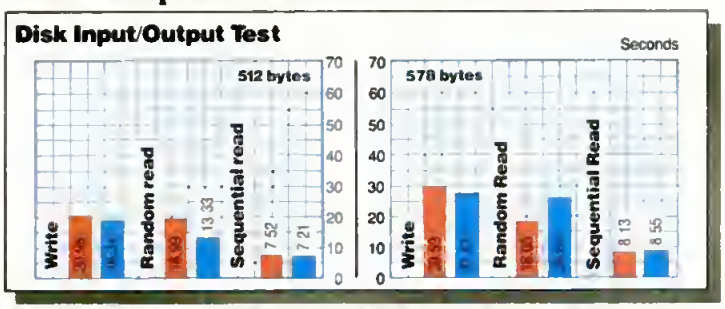
FileCard
Western Digital Corp.
2445 McCabe Way
Irvine, CA 92714
(714) 863-0102
List Price: $1,095
In Short: The FileCard functions smoothly but was the slowest drive tested. It includes a free memory upgrade, *XTREE*, and a foolproof setup program.
CIRCLE 661 ON READER SERVICE CARD

Diskard 21
Tandon Corp.
20320 Prairie St.
Chatsworth, CA 91311
(818) 993-6644
List Price: $995
In Short: The highest-capacity hard disk card available, the Diskard 21 fits in the PC's end slot without speaker relocation.
CIRCLE 660 ON READER SERVICE CARD

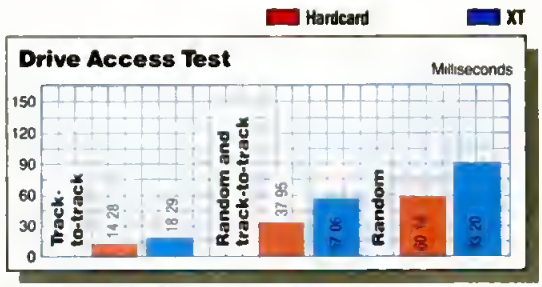
PHD System
Sysdyne! Products
Great West Technology
2955 Peralta Oaks Ct.
Oakland, CA 94604
(415) 562-1704
List Price: hard disk, $779.95; controller card, $269.95; docking port or mounting bracket, $45
In Short: The PHD is a modular system, of which a hard disk card is only one possible configuration.
CIRCLE 649 ON READER SERVICE CARD

Photographs: Les Morsillo

Plus Development Hardcard vs. IBM PC-XT



Disk Input/Output Test: This benchmark measures the time it takes to create a 200K data file using record lengths of 512 bytes and 578 bytes. The test program then does a random read of 256 records from this file, followed by a sequential read of the same records. The results are compared with those of the IBM XT.



Drive Access Test: Written by Core International, this benchmark measures a hard disk's seek time—the fundamental measure of how fast the drive responds to the disk controller's instructions. The types of seek, or access, times measured are track-to-track, or how long it takes the head to move to the adjacent track; random, or how long it takes to do a series of apparently nonsystematically selected track accesses; and average, the average of a series of random accesses.

The Hardcard fared best among the five cards in the Disk Access test, which measures raw head speed. In the Input/Output test, which more closely resembles an applications use, it was good at reading but slow at writing to a file.

daughterboards. According to a Western Digital representative, the performance of the respective drives "should be very close."

SLOT SHUFFLE Installing a hard disk card may demand the reshuffling of boards already in the machine. Plus and Western Digital are the only cards that comfortably take up one slot. Mountain and Tandon each claim a slot and a half, leaving room for a half-size card in the second slot. Tandon is sculpted to leave room for the speaker when it is installed in the end slot.

The Mountain and Sysdyne! drives each take up only one slot if you use Mountain's speaker relocation scheme. After removing all other expansion boards, you can detach the speaker and move it next to the A: drive. When a hard disk card is mounted on the end slot, it butts out into the unused space between the computer and the system cover.

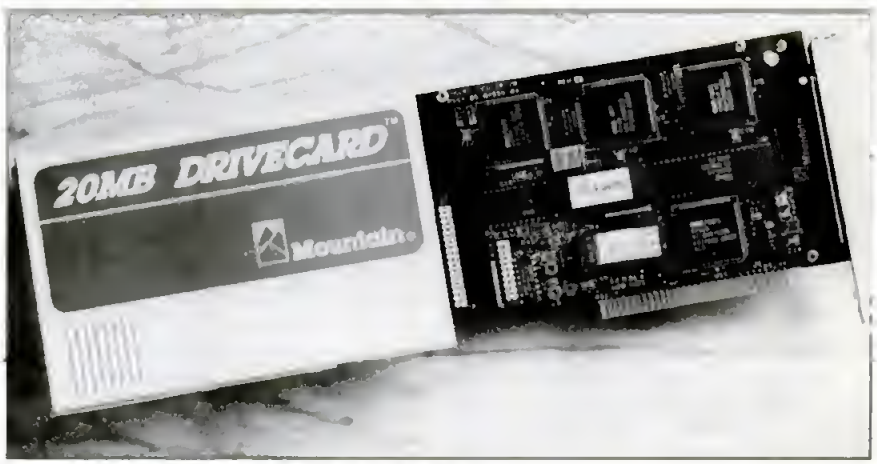
Western Digital's FileCard, while fitting neatly into one slot, offers a bonus in the 640K-byte memory card that is included, essentially at no extra cost. The card's list price is the same when it includes the memory boost, but users whose PCs are already "topped out" can bargain with dealers for a more favorable price on the hard disk card alone or wait for the inevitable software trick that will allow them to use more than 1 megabyte of RAM. Western also includes the *XTREE* disk maintenance program as a bonus with the FileCard, along with the most user-ingratiating disk set-up procedure of all of the hard disk cards we tested.

The most cumbersome hard disk card in terms of slot usage is the Sysdyne!, which butts directly against the neighboring cards. But while the PHD is sold as a hard disk card and was tested here as such, this is neither its primary use nor its most efficient configuration: The PHD is a modular system that can be used in other ways.

Once you've installed a hard disk card, how reliable will it be? These products haven't been in use long enough for anyone to have a valid answer, but any user who has experienced the heartbreak of a hard disk failure will want to ask. Any number of things can go wrong with a PC, but hard disk problems seem to be the most fatal and most common. Eric Swartz, director of engineering at Mountain, reports a lower failure rate for the card drives, explaining that any crashes that do occur are usually caused by bad electrical connections rather than by failure of the drive itself.

Plus product marketing manager Hank Chesbrough points out one reason why hard disk cards may be less subject to fail-

Mountain Computer's DriveCard, available in 10- and 20-megabyte versions, uses a 3½-inch disk that is identical to the company's more conventional drives.



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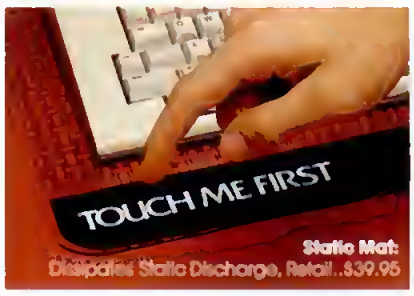

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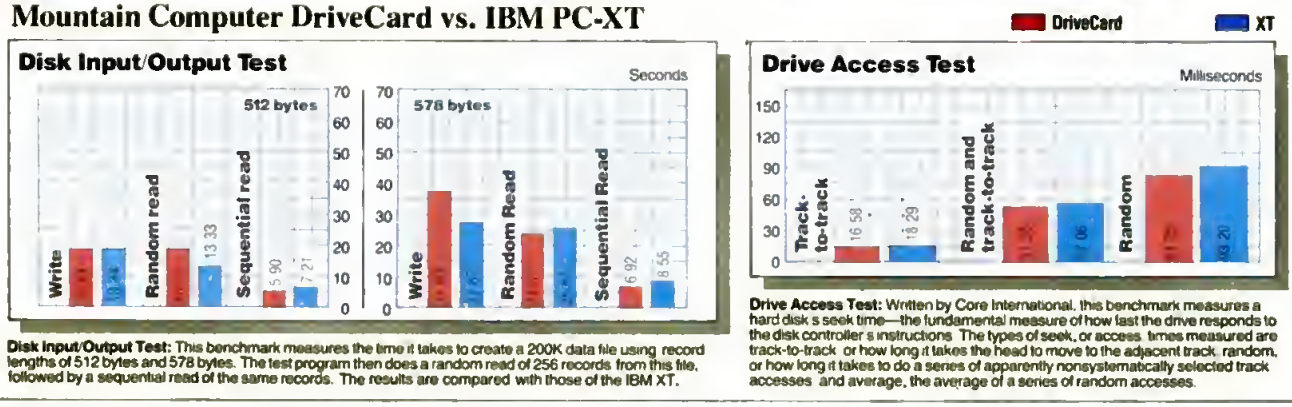
PC LABS BENCHMARK

Mountain Computer DriveCard vs. IBM PC-XT



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The DriveCard was best among the five in the sequential read. It was among the slowest of the five hard cards in writing to a disk, but as it virtually tied the XT at writing a smaller file, its performance has to be considered good.

ure than their cousins are. Drives are often built by one manufacturer, then sold to another manufacturer that adds its own controller. A hard disk card requires a greater concert of design.

Ken Goodman, vice president of marketing for board manufacturer Seattle Telecom and Data, warns that although moving hard disk cards around is easy enough, they should remain stationary because constant reinstallation can prove hazardous to the data and the mechanics. This flexibility, though, is what makes hard disk card technology so attractive, because it makes taking the system cover off and changing the hard disk so simple.

As a result, manufacturers of the hard disk cards are increasing the resiliency of the units. Mountain boasts higher shock-resistance specifications than those for its regular hard drives, while Plus claims that the Hardcard can operate in temperatures from 5 to 50 degrees Centigrade.

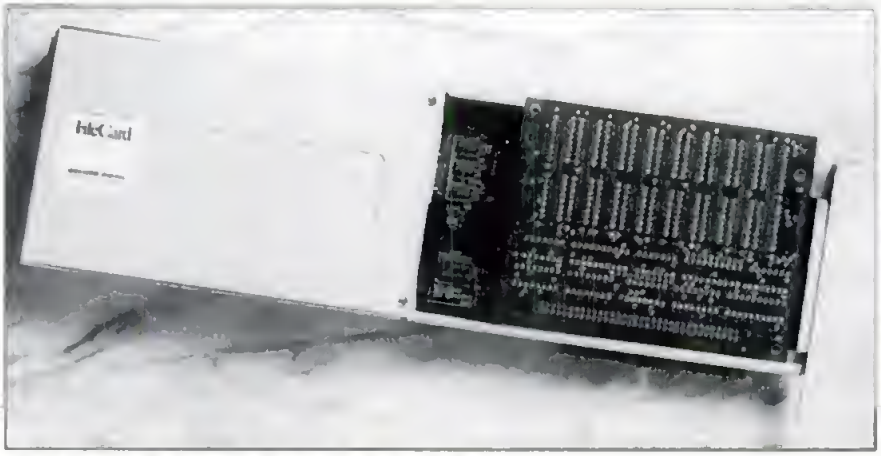
NONPLUSSED After installing a hard disk card, you may sit back and stare in wonder at how easily you got that coveted C: prompt on your screen. You'll find that the speed and performance of hard disk cards are comparable to regular internal and external subsystems and that there is no perceptible difference between running a hard disk card and running a traditional hard disk.

The hard disk cards' random access times ranged from Plus's 60.14 milliseconds to Western Digital's 159.06 milliseconds (tested against the 93.2 millisecond factory-installed PC-XT drive) on the CORE International Disk Spec test. The CORE test software calls these disks the "slowest disk drives available, like those selling for $500 or less." The Core test, however, uses the AT's hard disk access time as a standard; when stacked against standard XT disk access times, hard disk cards are comparable to the competition. It will be a while before hard disk cards are available for that little; as long as they're selling this well, the price will stay put.

The Plus Hardcard, Sysdysne! PHD, and Western Digital FileCard all have 10-megabyte capacities, while the Mountain is available in either 10- or 20-megabyte versions. Tandon's unfortunately named Diskard boasts 21 megabytes, giving it the competitive storage edge. This is not just a blatant play for a 1-megabyte advantage; the average Tandon hard disk has this capacity. Likewise, the 3.5-inch disk on Mountain's DriveCard is physically and electrically identical to that manufacturer's other drives. The difference lies in the miniaturization of controller parts.

Plus has taken miniaturization even further with its thinner-than-standard media. Another difference is that Plus has sol-

The 10-megabyte Western Digital FileCard comes with two bonuses: a 640K memory card and the popular XTREE *disk maintenance program.*



INSTALLING A SECOND HARD DISK

Getting DOS to recognize a second hard disk without reformatting your original one is a problem; here's one clever method that may do the trick.

Adding a second hard disk to your PC is an elegant way to solve the backup problem or simply to give you more space once you've filled up your first hard disk with essential files. The IBM PC DOS manual includes a section on setting up and configuring two hard disks when you purchase your system. However, the manual is no help if you want to add a second drive to a working system that already has a single hard drive.

If you were forward-thinking enough to buy two hard disks when you originally purchased your system or upgraded from floppies, you're in luck. To configure your system for the second hard disk, you just repeat the same setup process you used for the first one. But if you want to add a second hard disk to a working system, that procedure won't work; the system boot information on the original disk doesn't know about the second drive, and FDISK won't allocate a partition for it.

The difficulty is caused by the way FDISK operates. When you run it to set up your first hard disk, it checks the hardware and writes the number of available drives in the partition information for the drive. You can't change this data without reformatting the drive: Once a system is partitioned with a single drive connected, it will always assume you have just one hard disk available when you boot from that drive.

Booting DOS from a floppy doesn't work either; FDISK will allocate the DOS partition for the second drive, but after you format the drive and power up, your system won't recognize the new drive. Before you give up and reformat your first drive, try this approach but before you do anything, you should, *without fail*, back up your old disk.

Assign the new drive the letter C and the original drive the letter D by changing the drive-select numbers in the jumpers or DIP switches. (Instructions for doing so should be in the manual that comes with your new disk.) Now connect both drives to the controller card and power supply.

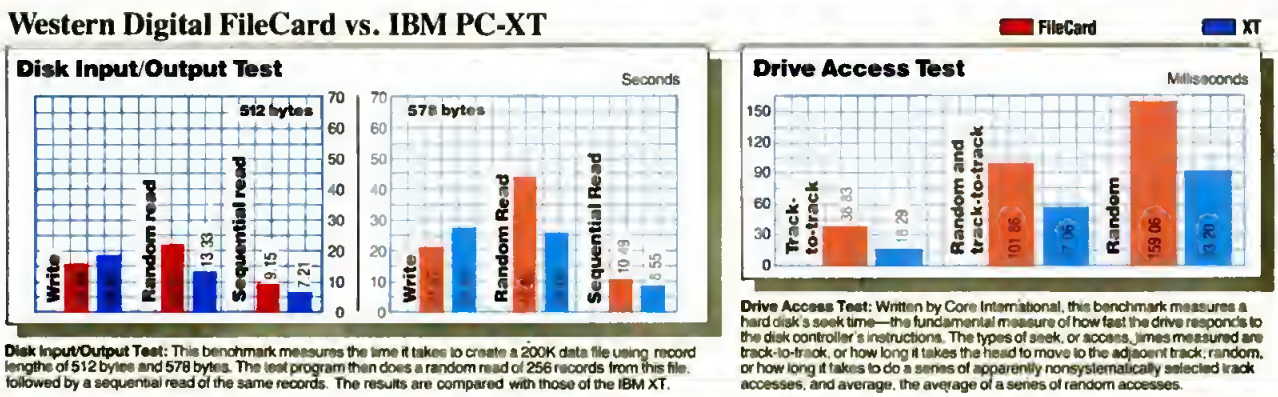
Next, boot the system from your DOS floppy disk. Do the primary formatting of the *new* drive (be careful not to reformat your original drive). Run FDISK on the new drive only and allocate the DOS partition on it. Now format the new drive for DOS with the command FORMAT C:/S/V. When you're finished, drive C: will be empty except for DOS, and drive D: will contain all your original files.

If this configuration is no good for you, then copy all the files from D: to C: (assuming that they are the same size drives or that the new drive, now C:, is larger) by creating each subdirectory on the new drive and then copying the appropriate files to it. Once you have transferred all the files to C:, you can reformat and repartition D:. Now your original files are on C: and D: is empty. This approach is a little tricky, but if you're careful and you can remember which drive is which, it will work.—**David Carroll**

David Carroll is the author of Programming with Turbo Pascal *(Prentice-Hall, 1985) and* Telecommunications with the PC Junior *(McGraw-Hill, 1986).*

PC LABS BENCHMARK

Western Digital FileCard vs. IBM PC-XT



Disk Input/Output Test: This benchmark measures the time it takes to create a 200K data file using record lengths of 512 bytes and 578 bytes. The test program then does a random read of 256 records from this file, followed by a sequential read of the same records. The results are compared with those of the IBM XT.

Drive Access Test: Written by Core International, this benchmark measures a hard disk's seek time—the fundamental measure of how fast the drive responds to the disk controller's instructions. The types of seek, or access, times measured are track-to-track, or how long it takes the head to move to the adjacent track; random, or how long it takes to do a series of apparently nonsystematically selected track accesses, and average, the average of a series of random accesses.

The FileCard did very well in writing data to a disk, but on all other tests it fared poorly compared to the IBM and to the other hard cards. It was the worst overall performer on the Drive Access tests of head movement speed.

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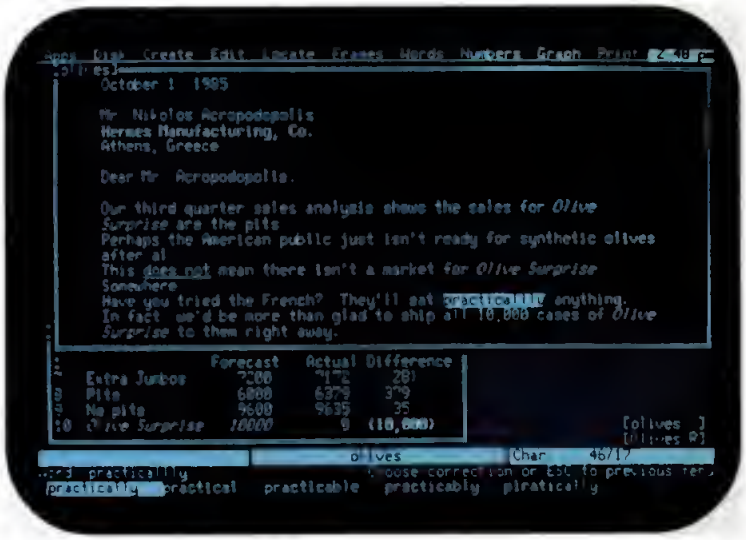

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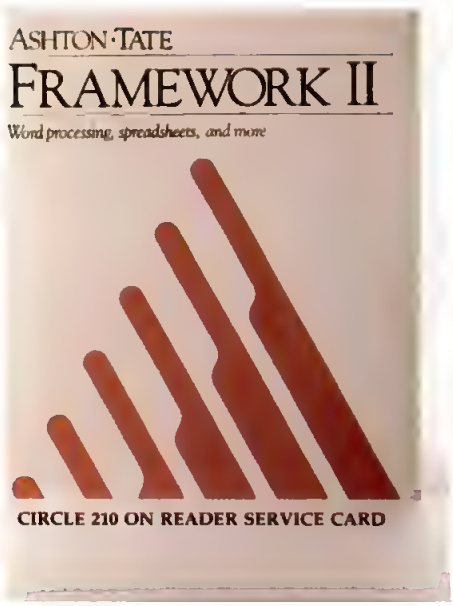

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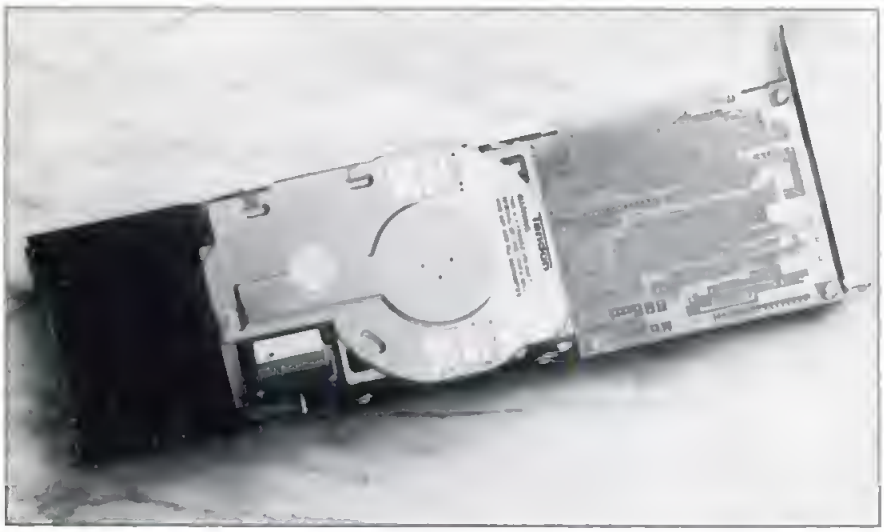


Just like Tondon's other hard disk drives, the Diskard 21 is a competitively priced 21-megabyte hard drive.

dered in its BIOS, while Mountain has socketed its in for easier upgrade.

Mountain, while mindful of Plus's sleek, fashionable design, seems to be taking a more cautious road. "The Plus technology hasn't been proven," a Mountain technical employee grudgingly concedes, "but it works."

DRIVE TO SUCCEED One noticeable difference among the hard disk cards is in the use of indicator lights that let you know when the drive is in operation. Plus earns a distinction by placing a flickering plus sign in the screen's upper-right-hand corner. Tandon, Western Digital, and Mountain all skipped the indicator lights for now, in favor of gaining time to market and perfect the process.

Sysdyne! has solved the problem in its own creative and effective way. A wire is plugged into the board and routed between the disk drives to a light that's attached to the front of the computer with an adhesive. It's a two-color LED; red indicates that the drive is being written to or accessed, while green means that the drive head has been parked to an unused area of data storage.

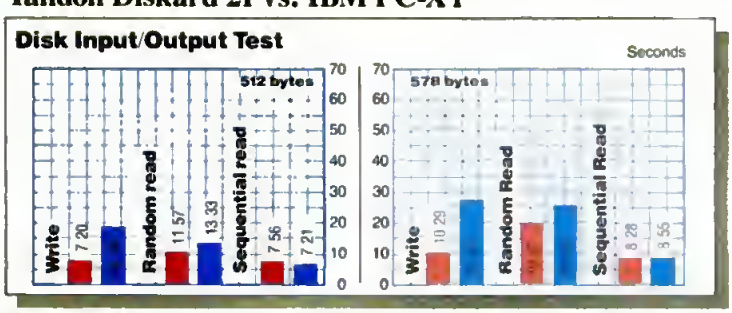
WILD CARD Sysdyne!'s PHD card stands apart from its competitors for several other reasons. While offering the PHD as a hard disk card, Sysdyne! is positioning it in several other markets as well. The PHD is a modular hard drive system that can be configured either as a conventional internal half-height drive, an external drive, or a card drive. The chief innovation is a docking port, used instead of a mounting bracket for the drive and selling for a mere $45. The port can be installed as a half-height or rolled out the back of the machine and strapped to the side. The hard drive media itself is removable in these conventional configurations, facilitating data security and turning the drive into a kind of low-cost Bernoulli Box (see PC News story in this issue).

Offering the hard disk card option was almost an afterthought for the Computer-Land-licensed company. To use the PHD as a hard disk card, you'll need the disk, a half-slot board into which the disk snaps, and a mounting bracket—all adding up to $1,093. This assortment of parts is only slightly more difficult to install than other hard disk cards: The pieces need to be snapped to the bracket and a power cable needs to be rerouted. All this means is that PHD takes 4 minutes to install instead of 30 seconds.

If the PHD is not a hard disk card in the strictest sense, it is in the same price and performance league, matching the other cards in both cost and efficiency.

PC LABS BENCHMARK

Tandon Diskard 21 vs. IBM PC-XT



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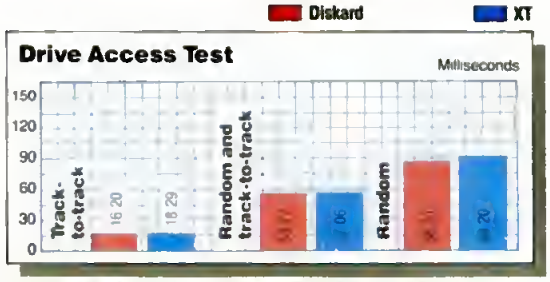

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The Diskard 21 not only beat the XT in every test but one, it had the best write times of the five hard cards tested by PC Labs. In fact, it beat the closest write time results (those of the FileCard) by more than 50 percent.

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PC 3/25

CIRCLE 361 ON READER SERVICE CARD

CLIMB EVERY MOUNTAIN Mountain's Swartz expressed admiration for the Plus Hardcard and correctly predicted last fall that the hard disk card market would soon become very crowded. When Mountain's card was first developed, Swartz thought that because of power and density requirements, the top capacity for hard disk cards would be 40 megabytes. He has since revised this projection; Mountain's higher-capacity hard disk cards currently under development will probably be on the market by the time the second wave of manufacturers debut their products.

■ While mindful of the Plus's sleek design, Mountain has taken a more cautious road.

Some peripheral manufacturers that might be expected to jump on the hard disk card bandwagon are more inclined to wait and see. Tallgrass views the hard disk cards as a product that may only be on the market for a short time, during which there will be fierce competition for a relatively small financial reward. AST is staying away from hard disk cards for the moment because it perceives the market as a low-end solution for individual users.

Sysdyne!'s PHD can be configured as an internal half-height drive, an external drive, or a hard disk card. Its docking port gives it this versatility.

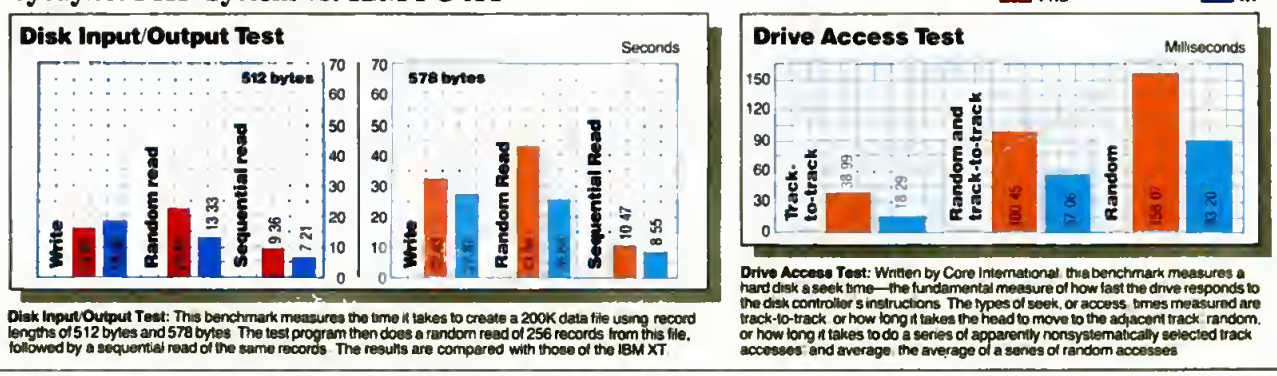
Quadram product manager Paul Mendel says that hard disk cards now have a "perception advantage," adding "when we come out with a product, it will be bulletproof." He feels there is no advantage in function between cards and regular systems, one way or the other. That Mendel perceives hard disk cards as being on an equal footing with hard disks, however, shows how far the products have come in a short time.

Though Plus, Mountain, Western Digital, Tandon, and Sysdyne! may have rushed to market, all of their products perform well and have been tested enough to preclude any widespread recalls or mechanical failures. But while all of them are adequate, none is ideal; the ultimate hard disk card is yet to come and will combine the best features of these breakthrough products. It will have the streamlined size and high speed of the Plus card with an increased capacity, a Western Digital memory boost and set-up program, and a Sysdyne!-style indicator light. A reasonable list price for this dream peripheral would be around $600.

There are plenty of reasons to buy a hard disk card today. There are also reasons to wait and give the product time to mature. From early indications, it is one PC peripheral that will be around for a while. ■

PC LABS BENCHMARK

Sysdyne! PHD System vs. IBM PC-XT



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The PHD System did not do well on the benchmarks overall. Its best showing came in writing the smaller data file to disk, but, in reading that same file, it had the slowest time of the five hard cards tested.

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CIRCLE 306 ON READER SERVICE CARD

Outliners (sometimes called "thought organizers") are a relatively new phenomenon—so new that manufacturers haven't yet agreed on either a name for the genre or exactly what it should accomplish.

Outliners are somewhat simplified word processors that are meant to process ideas rather than words. The theory behind these products is that most of our thinking tends to be scattered in various directions rather than linear; therefore, an outline can help organize our thoughts into a coherent whole. Once the outline is done, manuscripts, projects, and other planned events can easily be fleshed out and finished up with less trouble.

THE BUSINESS OF WORDS

OUTLINERS

A NEW TYPE OF WORD PROCESSOR TRIES TO HELP US ORGANIZE OUR THOUGHTS AND IDEAS BY PROVIDING A VARIETY OF LOGICAL STRUCTURES TO FIT THEM INTO.

PC LABS SPECIAL-PURPOSE WORD PROCESSORS

PRODUCT	PRICE	COMMAND STRATEGY: STATIC MENUS	COMMAND STRATEGY: DYNAMIC MENUS	COMMAND STRATEGY: KEYBOARD COMMANDS	COMMAND STRATEGY: WORD COMMANDS	TEXT DISPLAY: UNFORMATTED	TEXT DISPLAY: PARTIALLY FORMATTED	TEXT DISPLAY: FULLY FORMATTED	TEXT WINDOWS: HOW MANY WINDOWS	TEXT WINDOWS: HOW MANY DOCUMENTS	TEXT WINDOWS: FULL SCREEN	TEXT WINDOWS: PARTIAL SCREEN	DISK REQUIREMENTS: FLOPPY DISK	DISK REQUIREMENTS: HARD DISK	COPY PROTECTION	SPELLING CHECKER	ON-LINE HELP	ERROR HANDLING	REFERENCE DOCUMENTATION	TUTORIAL MATERIAL
OUTLINERS																				
daVinci	$59.95	S						■					□	■			■	■	■	■
Fact Cruncher	$99.95			K				■	2	2		■	□	■			■	■	■	■
MaxThink	$89.00	S			W		O	■					□	■			■	■	■	■
PC-OUTLINE	$49.95		D	K			O	■	9	9	■	■	□	■			■	■	■	■
Ready!	$99.95	S	D		W			■					□	■			■	■	■	■
ThinkTank	$195.00		D	K				■					□	■	⚿			■	■	■
THOR	$49.95	S		K				■					□	■			■	■	■	■

O = OPTIONAL ∞ = NO LIMIT ⚿ = KEY DISK REQUIRED R = HARD DISK RECOMMENDED ▮ = ADEQUATE ▮▮ = GOOD ▮▮▮ = EXCELLENT

Actually, any good word processor can produce an outline—the advantage of the more specialized product is to make the process of outlining as streamlined as possible. But because there are many different opinions on how to accomplish this end, different companies have formatted their products in a variety of ways.

Thought organizers tend to support the traditional indented outline format. They encourage you to first create one or more topics and then list your thoughts in rather random fashion under the appropriate topics, adding and subtracting headings and descriptions as they occur. Once you've got everything on-screen, you can then move your topics and comments around until they appear in a logical format. It is here that most outliners differ from more traditional word processors: instead of having to formally block out each idea, you can immediately and more easily move them to a new location. Some products even let you mark several topics and regroup them under a new heading.

Once you are happy with your basic outline, the program may then present you with several options. Some outliners allow you to then flesh out your thoughts by using their own (usually simple) word processors. Others permit you to export your outline into your word processor to incorporate it into a finished memo or speech.

The differences in outliners also extend to additional features. Some enable you to look at your entire outline and will "hide" subtopics in order to fit the outline on-screen, while others assume that you would rather concentrate on all the information within a single topic. All in all, outliners tend to differ widely in their outlooks on the thought process.

This report on outliners is the final section in our special report on "The Business of Words" begun in *PC Magazine*, Volume 5 Number 2. As with our previous reports, we have included with our reviews a chart that quickly shows all the major facets of each outliner, as well as expanded fact files that detail each product's features. (The guide to the mnemonics can be found in Volume 5 Number 2, page 95; a guide to the special features found in outliners is included here. You can also find a copy of the mnemonics guide on *PC Magazine*'s Interactive Reader Service.)

The decision as to which outliner is appropriate ultimately rests with you. Look here for the product that best suits your special needs.—**Barbara Krasnoff**

PC MAGAZINE EDITOR'S CHOICE

***MaxThink**—This little-known but very powerful outliner is as useful for its extra features as for the outlining capability itself. Not only does it provide you with a multitude of useful word processing functions but it gives you utilities to produce wall-chart outlines, include both text and graphic filenames within your outline, and, best of all, map out your hard disk.*

PC-OUTLINE—*In this modest package you can find a very rare creature indeed: shareware that has the slickness of its more "professional" peers. It accommodates itself to a wide range of user capabilities, and by not separating its word processor from its outlining functions, it allows you to be as concise or verbose as you like.*

Both MaxThink *and* PC-OUTLINE *provide you with an easily accessible outlining structure without strangling you with it.*

A Guide to PC Labs Expanded Fact Files: Special Outlining Formatting Features

(See page 95 of the January 28, 1986, issue for definitions of the abbreviations used. The following abbreviations are used only in these expanded fact files for outliners.)

Indented Outline Formats
- IL:nn = Indents Levels
- LL = Levels Flush Left
- CF = Classic Format (I.A.1.a.)
- NF = Numerical Format (1. 1.1 1.2.1)
- LF = Number/Letter Format (1 1A 1B)
- DF = Different Format
- RL = "Remembers" Previous Level
- IM = Indents Manually
- IA = Indents Automatically
- CO = Collapses Outline
- CL = Collapses Individual Levels
- XO = Expands Outlines
- XL = Expands Individual Levels

File Folder Formats
- NF:nn = Number of "Folders"
- CF = Classic Format (I.A.1.a.)
- NF = Numerical Format (1. 1.1 1.2.1)
- LF = Number/Letter Format (1 1A 1B)
- DF = Different Format
- RL = "Remembers" Previous Level
- CO = Collapses Outline
- CL = Collapses Individual Levels
- XO = Expands Outlines
- XL = Expands Individual Levels

Editing Capabilities
- DWS = Deletes with Subheads
- DOS = Deletes without Subheads
- PL = Promotes Levels (Folders)
- DL = Demotes Levels (Folders)
- MWS = Moves with Subheads
- MOS = Moves without Subheads
- AL = Alphabetizes Levels (Folders)
- LL = Relabels Levels (Folders)
- SK:nn = Number Key Words Searched
- RW:nn = Number Words/Characters Replaced
- SL:nn = Number Levels Searched

Other Functions
- MO = Moves Outlines
- EO = Exports Outlines
- IO = Imports Outlines
- LO = "Links" Outlines
- SW = Separate Word Processor
- EW = Embedded Word Processor
- RW = Can Revise Outlines with Word Processor
- CH = Charting Function
- NP = Notepad
- MM = Mail-merge
- WC = Windowing Capabilities

Hard Copy Formats
- Hl:nn = Levels (Folders) Indented
- HL = Levels (Folders) Flush Left
- CF = Classic Format (I.A.1.a.)
- NF = Numerical Format (1. 1.1 1.2.1)
- LF = Number/Letter Format (1 1A 1B)
- DF = Different Format

DAVINCI 1.12

Its name evokes the consummate Renaissance man, so you might expect *daVinci 1.12* to be the one outline processor that can do it all. Like the Florentine artist and inventor, this little program is versatile and talented. Unfortunately, its limited-level structure and cumbersome outline-editing features keep it from being a masterpiece on the order of the *Mona Lisa*. But if your needs are simple and you don't mind not being able to see your entire outline while you edit it, *daVinci* has enough interesting features to be worth a look.

If nothing else, the program is fast and easy to learn. *daVinci* loads like a rocket, performs like a Porsche, and does everything with just a few simple menus and function keys. Getting the program up and running is as uncomplicated as typing "copy *.*", glancing at the menu of system parameters (the defaults will probably be fine), and diving right in. You probably won't need it, but run through the excellent manual-based tutorial anyway—it's a quick, easy way to commit the various program features to memory.

The pink and turquoise opening screen is one of the most unattractive I've ever seen—fortunately, the three menu choices are straightforward enough so that you don't have to spend a lot of time looking them over. You can either edit a DOS text file with the program's text editor, edit system parameters such as default drive and printer port, or process a model (*daVinci*-ese for outline).

Choosing option three, "Process a Model," places you in the outline processor. Here you either choose a model from your data disk to work on or start a new one and give it a name plus a 60-or-fewer-character description. *daVinci*'s outline processor is unusual in that it has two distinct display formats—standard and view. In the standard format, you can see only one level at a time, but you can move around and edit the outline. Moving is simple enough: The Cursor right key drops you a level further into your outline; the Cursor left key moves you back a level. The F5 key puts you into edit mode, which is signified by a reverse video cursor. A cautionary note: Each time you change levels, you must remember to hit F5, or you will find yourself foolishly tapping away at the keyboard with no effect on the program.

In the view format, you can see and print the entire outline in classical outline form, but you cannot edit it. Not being able to see your entire outline at once while you are working on it makes editing a cumbersome chore. To make editing in standard format less cumbersome, all headings are numbered. Moreover, the program attempts to inform you of the outline's total content and your current position in it by putting a plus sign before the headings that have subheadings below them and by maintaining a path display—that is, level and sublevel number—in the lower right-hand corner of the screen. Unfortunately, the plus sign does not tell you what is below the level you can currently see or even how many sublevels there are, and the numbering in the path display does not correspond to the numbers in the display or even to the ones you see in view mode. You can switch between standard and view formats quickly, but I found it annoying to have to either print out the outline or remember exactly where I was going every time I wanted to move a portion of my outline.

■ The program is fast and easy to learn. daVinci loads like a rocket and performs like a Porsche.

Even more annoying is the fact that outlines cannot exceed five levels in depth. Mapping out a complicated outline only to find that you cannot add that last crucial level is a little like reaching the front of a long line at the Motor Vehicles Department just as the clerk decides to quit for the day. All outline processors cut you off at some point, but this one cuts out too early in the game to qualify it for lengthy or complex tasks.

You can produce a full report or article with *daVinci*, but it's not easy. At any lev-

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DisplayWrite 3 is "menu-driven" to make learning fast and straightforward.

It lets you do all the expected things, like centering and justifying and moving text every which way.

Plus a number of highly unexpected things, such as automatic outlining and footnoting.

You can edit parallel columns of

processing ever? That's the whole point.

text, then re-edit without a lot of rethinking.

You can print one document while you work on another.

You can produce form letters that seem more like personal letters.

You can check your spelling (with the help of a built-in dictionary) while you hyphenate and paginate in one pass.

You can even process numbers. DisplayWrite 3 can add, subtract, multiply and divide.

And if, after writing an important proposal, you need to change your product's name from Sudso to Sudsy in 156 places, you can, automatically.

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FOR MORE INFORMATION ABOUT IBM DISPLAYWRITE SERIES CIRCLE 270 ON READER SERVICE CARD

el of your outline, *daVinci* lets you enter its ASCII text-editing mode with a touch of the F6 key. You can write up to 50 lines of text for each numbered heading in your outline, and when you print, you can choose to print both the report and the outline together or just the report. The left margin can be variably set in increments of five spaces, but the right margin is fixed at 78 columns in word-wrap mode. In order to move text around within a block, you must invoke the function for exporting lines into a disk file, specify the number of lines down from the cursor that you wish to cut, then reimport those lines where you want them to end up. You will probably want to use *daVinci*'s editor strictly for notes, which you can export to your word processor for formatting and touching up, and then either print or reimport into *daVinci*.

There are some enlightened touches that may redeem this program. *daVinci* includes a simple five-command, five-variable programming language. By programming it to prompt for input variables and then perform simple mathematical calculations with numerical input, you can have *daVinci* produce interactive form letters and simple reports. This nifty little gee-whiz function isn't really needed in this type of program, but it is a simple, easy-to-master, and useful tool that might on its own attract interest in *daVinci*. More useful in the normal sense in which you might use an outline processor are the pop-up calendar and calculator windows that you can invoke at any stage in the program's execution. Better still is the program's built-in autodialer, which you can combine with an outlineful of numbers to create a mini-communications program.

daVinci represents a pretty good attempt at a "renaissance" outlining tool. It does most of what you want such a program to do, and then some. Unfortunately, however, much of what it does it does not do all that well. In order for an outline processor to be truly useful, it must be simple, flexible, and intuitive enough to aid the thinking process without getting in the way. *daVinci* has enough easy-to-learn features that it will probably help your thinking, but it is too rigid and limited to be useful for serious outlining tasks.

—Paul M. Stafford

EXPANDED FACT FILE

daVinci 1.12

List Price: $59.95

Applied MicroSystems Inc
P.O. Box 832
Roswell, GA 30077
(404) 475-0832

Requires: 256K RAM, two disk drives, DOS 1.0 or later

CIRCLE 687 ON READER SERVICE CARD

FORMATTING FEATURES FOR FINAL TEXT
Paragraph Formats: JL
Margins: LM:0, RM: 78
Character Formats: ASC

Page Formats: GL, LP: 60
Tabulation Format: TL

EDITING SCREEN DISPLAYS
Nontext Display: RC
Text Display: WA

TEXT ENTRY AND EDITING
Typing Editing: IT, OD
Cursor Movement: CM, NC, NL, BL, **BD, SU,** SD
Block Editting Tools: MV, DE, DF

FILE HANDLING
Document File Strategy: PG, DF, ASC, **DS:500** LINES
Document Saving: NB, MS, EN, ER, PL
DOS Facilities: DR, MU, CDK, ADK, SDR
File Import and Export: IM, IAL, EAL

SPECIAL FEATURES
Other: MS, TC

SPECIAL OUTLINING FEATURES
Indented Outline Formats: IL:5, CF, IA, XO
Editing Capabilities: DWS, PL, DL, MWS, AL, LL
Other Functions: SW, EW
Hard Copy Formats: HI:5, CF

daVinci doesn't allow you to view your entire outline while in editing mode, which can prove to be a handicap to effective editing.

FACT CRUNCHER 2.0

When Professor Higgins in *My Fair Lady* asked, "Why can't a woman be more like a man?" he meant it as a rhetorical question. But when software developer Ray Bammes asked, "Why can't an outliner be more like a spreadsheet?" he came up with a practical answer: a text outliner that he called *Fact Cruncher*.

If the kind of outlining you do is fairly complex, then *Fact Cruncher 2.0*, with its attention to the details of organizing information into an outline, may prove to be a challenging and useful tool. *Fact Cruncher* is divided into three editing modes: data file editor, outline editor, and text editor. Each component provides its own type of tools for organizing and keeping track of your data.

The data file editor lets you create, edit, and display batch files, source programs, and other types of text. It makes file maintenance easier, with such features as the ability to create a header record for a data file so that it appears in the main *Fact Cruncher* file directory. The data file editor lets you enter and edit lines containing up to 255 characters and can also split the screen, creating a window that lets you call up another program file for editing and string searches.

TANGO OF IDEAS Most of the outlining is done through the combined work of the outline editor and the text editor. The outline editor itself can be used minimally as a blank slate for organizing ideas, or more fully as a chart for annotating outline information and keeping track of the outline's progress.

The outline editor considers each line in the file as an individual data record, which *Fact Cruncher* calls a component. A horizontal line across the top of the outline editor screen labels various headings that

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By Jove, Holmes, open and shut simultaneously! It's perfect for those powerful integrated, multi-disks systems—and no one's thought of it before! Holmes, you never cease to amaze me.

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Shut—locking for 50

Built-in carry handle

USA: P.O. Box 3725, Culver City, CA 90231. Telephone 213/641-1800. EUROPE: Rue de Florence 37, 1050 Bruxelles, Belgique. Telephone 02/538.61.73.

CIRCLE 314 ON READER SERVICE CARD

"code" the record. These headings include a component description for headline titles and text, a level number that indicates the level to which the record is indented (and therefore its position in the outline), and a line number to order each record.

The component ID assigns an identity to the record, which tells you in what level or headline the record is located, and in what order it appears below the headline. This procedure is similar to categorizing outlines with roman or arabic numerals (I., A., and so on).

Two more columns are for entering codes that indicate the current status and priority of a record. These two features, together with *Fact Cruncher*'s other outline columns, make the program useful for project management or any other time-sensitive planning chores.

TOP OF THE CHARTS *Fact Cruncher* also has a charting facility that turns outlines into detailed organization charts. The example disk that comes with the program contains files that illustrate project planning applications as well as sample charts and is worth studying.

The text editor serves as *Fact Cruncher*'s word processor. Although its primary job is to generate reports, its optional features give it the ability to bring outline files into the current text file. It also has a file directory for keeping track of those files, plus the ability to let you selectively read text out of another file for insertion into the current file.

Files in the text editor are formatted by codes that are always visible in the format field located to the left of the text editor screen. These codes allow for centered, right-justified, and emphasized text, as well as other choices, and include a tool for sending control characters or text to your printer.

Both the outline editor and the text editor have block move, copy, and delete features. Another tool, called Stack, lets you block out text and copy it into a temporary stack file. From the stack file you can create an addendum text file that can then be read into a third text file. The outline editor has a useful search-and-replace function that lets you manipulate words or strings of characters, as well as perform wildcard searches.

MENU, PLEASE A separate menu is presented when you enter the date, text, and outline editors. The three editors use common commands, except for commands unique to each editor. The home or main menu lets you access all three, as well as a universal file directory that can also be broken down by type of file. For example, if you want to read the directory of the C: drive, you can also get a detailed report of which files are outline, data, and text, plus a brief description of what's inside each file.

File Utilities offers several functions. You can combine two or more outline files, display or print outline files, print reports, or even convert outlines into text files. An outline-numbering function lets you assign component ID numbers to the records in the outline file. All the utilities have on-screen prompts that are fairly straightforward and easy to follow.

A display-and-print function, also accessed from the main menu, provides a way to gain easy access to outlines and report files for quick reference. The menu in this function also lets you prepare a file for printing.

Fact Cruncher's many tools and capabilities are a strength, especially for large outlines and detailed planning where cross-referencing is important. However, I found the program just a bit complicated at times, and a predisposition to being well

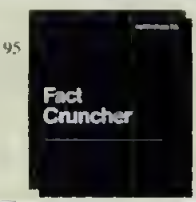
EXPANDED FACT FILE

PC LABS

Fact Cruncher 2.0

List Price: $99.95

InfoStructures Inc
P O Box 32617
Tucson, AZ 85751



Requires: 256K RAM, two disk drives, DOS 2.0 or later.

CIRCLE 686 ON READER SERVICE CARD

FORMATTING FEATURES FOR FINAL TEXT
Paragraph Formats: JL, JC
Margins: LM:0, RM:74, AI
Line Spacing: LS:1-2, LF
Character Formats: VP, PS, PW, BO, IT, UL, SP, SB, CB, ASC
Page Formats: LIT, GL, GR, LP:51, HT, HL, FB, PL:11, PW:14, MP
Tabulation Format: TL
Header/Footer: SL, UM, AN, PA

EDITING SCREEN DISPLAYS
Nontext Display: RC, DF, DA, TI
Text Display: SL:20, SC:74, WA, FJ

Fact Cruncher has three separate editors—date, text, and outline—that share many common commands.

TEXT ENTRY AND EDITING
Typing/Editing: FC, IT, CA
Deletion Formats: CD, WA, LA, LE, SA, DA
Cursor Movement: CK, NC, NSC, NPG, BL, BSC, BD, SU, SD, SL, SR, JC, JL, JP, CK
Block Editing Tools: BE, AB, CH, WD, LN, SE, PH, CO, CE, BC, DO, MV, CP, DE, AR, HA, DF, AW
Search and Replace: FO, BK, CS, CP, AS, WS, WR
Undo Utility: UD

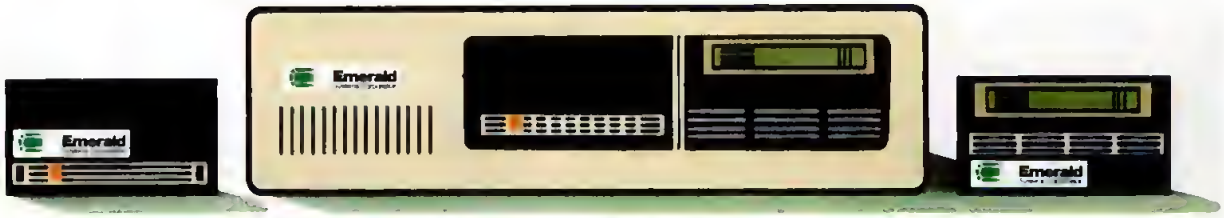
PRINTER SUPPORT
NP:30, UP, PT, QU, CH, OF

FILE HANDLING
Document File Strategy: FD, DF, ASC
Document Saving: AB, MS, EN, EA, DL, EL, PL
DOS Facilities: DR, MU, CDK, ADK, CDR, ADR
File Import and Export: IM, IAP, EAL

SPECIAL FEATURES
Other: SF, FP, AT, OG, DV

SPECIAL OUTLINING FEATURES
Indented Outline Formats: IL:27, LL, CF, NF, RL, IM, IA
Editing Capabilities: DWS, DOS, PL, DL, MWS, MOS, LL, RW:UNLIMITED, SL:UNLIMITED
Other Functions: MO, EO, IO, LO, SW, CH, NP, WC
Hard Copy Formats: HI:9, HL, CF, NF

THE LEADER.



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More power users—and Fortune 1000 companies—are turning to Emerald. And why not? Only Emerald can offer today's most advanced mass storage technology.

Pack News is Emerald History

The pack is just beginning to address the PC-DOS 32-MegaByte barrier, and they're starting to understand your need to treat more than one hard disk as a single file or volume.

But they're not telling you that Emerald invented the technology that broke the 32-MegaByte barrier. Or that Emerald's DiskMeld™ could already combine 2 physical hard disks into continuous volumes of up to 236 MegaBytes, years ago.

At Emerald, running mainframe and mini-type applications on a PC or AT's hard disk isn't news—it's history.

Faster Than You Think

Today, Emerald's Extended Mass Storage Architecture™ (EMSA)™ is solving problems the pack hasn't even heard of. With innovations so advanced that no one can match them. Yet so accessible, anyone can use them.

Like Disk Caching that improves overall access time and shortens your processing day. And user-selectable interleave that increases throughput up to 50% over the AT's normal rate.

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Emerald tape backup subsystems now feature Archival Storage Protector™ (ASP),™ an all-new backup and restore utility. ASP monitors your backup in real time with digital and graphic displays. It offers super-fast streaming, password security, and a programmable time-activator for unattended backup. Plus multiple sessions and 3 types of file-by-file backup.

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THE PACK.

organized seems to be a prerequisite. Those looking for a quick remedy to scattered thoughts had best beware.

For example, you aren't able to flexibly handle text in the outline editor because you are limited to a certain number of characters and don't have room to make quick notes within the same mode. Additionally, the outline editor's many headings and organizational columns, which are used for annotating the records, are a bit like calling for a symphony orchestra when a one-man band would do just as well.

■ Fact Cruncher is an efficient assistant for planners who have to keep track of project-planning details.

The manual could offer more information on the program's features, and more instruction. While examples are part of each chapter, they don't demonstrate everything you need to know to set up files. The demonstration disk could also provide more instructional depth, especially for users new to outliners.

PLANNER'S DELIGHT But all the preparation that went into *Fact Cruncher*'s outlining power makes it an efficient assistant for planners who have to keep track of project-planning details and loads of facts. In this respect it resembles a spreadsheet, since it is equipped to keep track of each and every "cell," or data entry.

Fact Cruncher is also capable of working like a database, as developer Ray Bammes points out. It can store, keep track of, and easily retrieve information—as does a database—yet is simpler to learn.

At $99.95, *Fact Cruncher* offers more than meets the eye for determined "data crunchers" who thrive on order and compartmentalized organization and contains enough intricacies and idiosyncrasies to have its own kind of character.

—Virginia Dudek

MAXTHINK 3.1

MaxThink 3.1 is the "new kid on the block" when it comes to standalone outline programs for the IBM PC, and it is a shame that it is not better known. Here is a program that offers more than the standard product and at a lower price than most. I don't happen to use an outlining program, except for some dabbling with *Framework*, but *MaxThink* may have found a home on my (crowded) software shelf.

MaxThink does not have every feature you might ever want. It does not have multiple windows, and you cannot copy items from one file to another just by moving them back and forth between split-screen displays. The word processing functions are adequate but weak. (I outlined this review and started to write the paragraphs using *MaxThink*, but I soon took the outline into my favorite word processor to finish the job.) The printout options are limited, so you have little or no control over mixing type fonts, header and footer placement or contents, and other amenities. *MaxThink* cannot even add 2 + 2, because it has no math capabilities.

So just what can this outline program do? If you simply want a way to manipulate and organize related lists of ideas and data, *MaxThink* offers an impressive assortment of performance characteristics. It responds quickly to commands, and text entry is smooth and swift. It has a Microsoft-like menu at the bottom of the screen; you select commands with the space bar or the command's first initial. Submenus appear in the same format. Options are selected as fast as you press the keys. The program makes good use of the PC keyboard, providing some shortcuts (the Ins key performs an insert-after-enter sequence) and standard functions such as range marking. Should you wish to avoid the menus, you can switch to the MaxMode and issue commands directly.

MaxThink offers many features similar to word processing programs. When working with text, you may select insert or overstrike modes and toggle back and forth between them. Block actions can store one or more items in a buffer, and blocks may be easily saved to disk and then merged into other files. You can copy, move, and delete single items or ranges of items. There is also an Undo command that reverses almost any command. It is a "rotating" undo—that is, it toggles the effect of the last command on and off. Like many word processors, *MaxThink* also lets you preview the final formatted version of your outline on the screen before you commit it to paper.

Its outlining functions really make the program shine. You can quickly move a topic from one level to another or sort subtopics (by straight ASCII or "dictionary" order), starting at whichever position you wish. You can move between levels, expanding or collapsing your outline to show as many levels of the outline as you wish. You can select your favorite numbering system and set up your outline to display the number of subtopics per item if you wish.

■ If you want a way to manipulate and organize related lists of ideas and data, MaxThink offers an impressive assortment of performance characteristics.

The program's best features are its Brainstorm options. With these, you may sort the topics in a group or quickly sort them into your own priority order. The Binsort option is a terrific procedure that lets you take a "raw" list of topics and arrange them in groups, automatically making them subtopics of those groups. The process is remarkably quick, easy, and powerful. If you don't like the results, you can "levelize" a list, bringing the subtopics up to the same level as their headings, and you can even randomize the order of items to give yourself a fresh look at the list.

MaxThink's power works best in con-

junction with other software tools and has the import and export features that make this feasible. It can import any ASCII file, using leading spaces as the cues for the different levels of topics. It can export its outlines as formatted ASCII files or preformatted *WordStar* files; but for many cases, these special formats won't be necessary because the *MaxThink* files are pure ASCII to start with: Most word processors will accept them directly. (I did nothing with this review except call the outline file into *XyWrite* and start writing.) These features make *MaxThink* useful for programming in structured languages because your source code files can be drawn directly into *MaxThink* and your routines and subroutines can be instantly organized into an attractive and easy-to-decipher outline.

Best of all are what I call the "exotic" features. These can take some applications of *MaxThink* from merely good to outstanding. A separate utility prints your outlines in wall-chart format; before it starts, it warns you how many pages to expect and gives you a chance to call it quits before the printing starts. You can insert a filename instead of a topic heading, and then at a press of a function key, that file will be displayed on the screen. What makes this function incredible is that you may specify either a text file or a *PC Paint* file if you want to include a picture with your notes. My favorite feature, however, is the utility that reads your disk directory and creates an outline of it. This process takes some time, but it makes an invaluable tool for managing your hard disk. This feature alone is almost worth the $89 purchase price.

In sum, *MaxThink* is packed with functionality, and at the price, it is worth experimenting just to see whether or not an outline processor is something you need. It is vastly improved over its earlier versions; the company is committed to continued expansion and refinement of its fine program. *MaxThink* is a good product, destined to get even better.—**Alfred Poor**

EXPANDED FACT FILE

MaxThink 3.1

List Price: $89

MaxThink
230 Crocker Ave.
Piedmont, CA 94610
(800) 227-1590
(800) 642-2406 (in Calif.)

Requires: 256K RAM, one disk drive, DOS 2.0 or later.

CIRCLE **685** ON READER SERVICE CARD

FORMATTING FEATURES FOR FINAL TEXT
Paragraph Formats: JL
Margins: LM:1, RM:256, AI, AO
Line Spacing: LS:1-6, SA, KP, KN
Character Formats: ASC
Page Formats: L1T, LLB, GL, GR, PW:256
Tabulation Format: TL
Header/Footer: SL, AN, PA

EDITING SCREEN DISPLAYS
Nontext Display: DF
Text Display: SL:19, SC:80, WA

With MaxThink's Brainstorm feature, you can quickly sort your topics into your own priority order.

TEXT ENTRY AND EDITING
Typing/Editing: FC, IT, ED, CA
Deletion Formats: CD, WA, WE, LA, DA
Cursor Movement: CM, CK, NC, NL, NW, NSC, BL, BSC, BD, JL, JM
Block Editing Tools: HL, MV, CP, DE, HA, DF
Search and Replace: FO, CS, WW, AS, WS, WR, VY
Undo Utility: UD, UR, RP

PRINTER SUPPORT
NP:1, UP, PS

FILE HANDLING
Document File Strategy: FD, DF, ASC, DS:400 KBYTES
Document Saving: AB, MS, EN, ER, EL
DOS Facilities: DR, CDK, ADK, CDR, ADR
File Import and Export: IM, IAL, IWS, EAL, EWS

SPECIAL FEATURES
Other: KM, CK, CS, OG, DV, TV

SPECIAL OUTLINING FEATURES
Indented Outline Formats: IL:99, CF, NF, LF, RL, IA, CO, XO
Editing Capabilities: DWS, PL, DL, MWS, MOS, AL, LL, SK:UNLIMITED, RW:UNLIMITED, SL:99
Other Functions: MO, EO, IO, EW, RW, CH
Hard Copy Formats: HI:40, HL, CF, NF, LF

PC-OUTLINE 1.00

There is something satisfying in coming across a really fine shareware program. Perhaps it is because such a product proves that even in the highly competitive and overpriced microcomputer market, the spirit of entrepreneurship is still alive. (It could also be because shareware tends to be relatively inexpensive.)

For those of you unfamiliar with the term, shareware is software that can be freely copied and shared, with the proviso that those who like the program register with the company by sending a certain amount of money. By doing this, users not only support the concept of sharing low-cost software, but also receive a typeset copy of the manual (a partial copy is usually included on-disk), the latest version of the program, and notices of updates.

PC-OUTLINE 1.00, which was released on January 1 of this year, is produced by SoftWorks Development, which, according to its press release, was founded in 1984 "to develop next-generation outlining software for the IBM PC." While I wouldn't go quite that far, I must admit at the outset that *PC-OUTLINE* is a very impressive product. It seems as if the folks at SoftWorks started with a copy of *ThinkTank*, sat down, and asked, "How can this be improved?"

TWO MODES IN ONE Unlike most similar products, which separate the outlining and word processing modes, *PC-OUTLINE* conveniently merges the two functions. Consequently, the program allows you a broad range of editing flexibili-

ty while retaining the outline structure.

In fact, *PC-OUTLINE* could appropriately be renamed *PC-CHOICE*. First, you are given the option of either calling up the program and then quitting when you are done, or typing PCO/R and letting the program sit permanently in RAM, to be accessed anytime you press Ctrl-\. This is helpful for enthusiastic outliner users who want their programs constantly at hand. Moreover, you cannot use *PC-OUTLINE*'s block import/export feature unless it is RAM-resident.

Once you have decided to either start a new outline or choose a previously saved one from an on-screen menu (all outlines are given the suffix .PCO), you are then brought to the main editing screen, which includes a top-screen menu, a ruler that indicates tab locations, and a two-line help message that varies according to what you are doing at the moment. It also includes, just under the menu, various file information including the pathname and filename, page, cursor location, time, and window number (which, if you are working on a single screen, is assumed to be 1).

■ PC-OUTLINE offers you an almost endless series of methods to transmit commands.

PC-OUTLINE also offers you an almost endless series of methods by which to transmit commands. For example, if you wanted to save a current file, you could do it in one of the following ways:

First, you could access it directly from one of a series of submenus. *PC-OUTLINE*'s main screen has a permanent listing of main command topics—File, Outline, Edit, Display, Print, Hide, Show, Window, and Advanced—across the top. Each has a menu attached to it that is opened by either hitting the Ins key and then scrolling across the menus using the cursor keys, by hitting the Slash key and then the first letter of the menu desired, or by hitting the Alt key simultaneously with the same first letter.

Once you are in the File menu (which holds the Save command), you are faced with a list of available functions along with a one-key mnemonic and, in most cases, a Ctrl or function key combination. You can now save your file by either using the Cursor up/down keys to highlight the command word Save and then pressing Return, or by hitting the one-key mnemonic S.

The Ctrl key combination (in this case, Ctrl-S) listed in the menu is a reminder that there is a second, quicker way to save your file: Simply hit Ctrl-S from within the editing screen. Thus, the pull-down menus function as context-sensitive help screens as well; I found that if I could not remember how to immediately access a function, a quick run through the menus was all I needed.

There are several commands that cannot be given directly by key combinations but must be accessed from the appropriate pull-down menu. This is, presumably, because the program's writers ran out of mnemonics. There are also several functions, such as search and replace, in which you must go through several submenus. *PC-OUTLINE* does provide an alternative for those who become impatient with this system; there is a macro function under the Advanced menu that allows you to create your own key definitions.

Like *ThinkTank*, *PC-OUTLINE* automatically assumes that you want to work in an indented outline structure. You have a

EXPANDED FACT FILE

PC-OUTLINE 1.00

SoftWorks Development
750 Sterlin Rd., #142
Mountain View, CA 94043
(800) 446-2263

List Price: $49.95
plus $5 shipping/handling

Requires: DOS 2.0, 128K RAM, one disk drive.

CIRCLE 688 ON READER SERVICE CARD

FORMATTING FEATURES FOR FINAL TEXT
Paragraph Formats: JL, JR, JC, JN
Margins: LM.1, RM.128, AI, AO
Line Spacing: LS:1
Character Formats: PW, BO, IT, UL, SP, SB, ST, SC, CB, IBM
Page Formats: LIT, LLB, GL, GR
Tabulation Format: TL
Header/Footer: AN, RN, PA

EDITING SCREEN DISPLAYS
Nontext Display: RC, CC, LN, PN, DF, DK, DR, DA
Text Display: SL:21, SC:80, WA, FJ

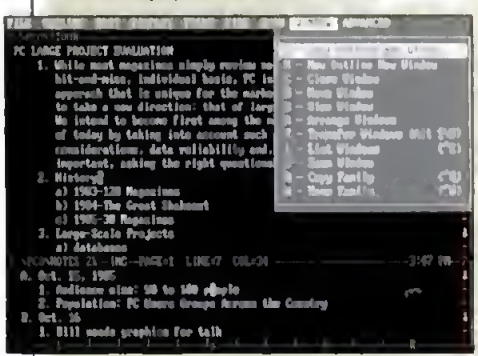
TEXT ENTRY AND EDITING
Typing/Editing: FC, IT, ID, CA
Deletion Formats: CD, WA, LA, LE, DA
Cursor Movement: CK, NC, NL, NW, NP, NSC, BL, BP, BSC, BD, SU, SD
Block Editing Tools: HL, AB, MV, CP, DE, AR, DF, AW
Search and Replace: FO, CS, CI, AS, WS, VY
Undo Utility: NA

PRINTER SUPPORT
UP, PW, PS

FILE HANDLING
Document File Strategy: FD, DF, CT, OTH, DS:64000 BYTES
Document Saving: AB, DB, MS, AT, AD, ER, EL
DOS Facilities: DR, MU, CDK, ADK, CDR, ADR
File Import and Export: IAP, IWS, IOTH, EAL, EWS, EOTH

SPECIAL FEATURES
Other: KM, CK, OG, DV, TV

SPECIAL OUTLINING FUNCTIONS
Indented Outline Format: IL:50, LL, CF, NF, RL, IA, CO, CL, XO, XL
Editing Capabilities: DWS, PL, DL, MWS, AL, LL, SK:50, RW:50, SL:ALL
Other Functions: MO, EO, IO, EW, RW, WC
Hard Copy Format: HI:50, HL, CF, NF



The bottom of these two PC-OUTLINE *windows is now active, as indicated by the "live" data on its overhead ruler.*

choice of several different formats, including sequential (A., 1., a.), procedural (1.0, 1.1, 1.12), bullets, and no numbering at all. Within each of these, you can format for uppercase and lowercase, Arabic or Roman numeral, and the period or the close parenthesis symbol, making this possibly the most flexible outliner around today for formatting material.

PC-OUTLINE treats itself as a word processor that outlines. Levels are not restricted to one-line entries; as you continue to type, the words wrap around as in any word processing program. You can set the program to either follow the first-line's margin or indent/outdent the first line. When you want to create a new level, you hit Ctrl-N from the previous line. The new number will appear directly below the previous entry in proper alphanumeric sequence; you can then use the cursor keys to move the entry to any part or level of the outline you wish. Once you start typing, the level is set, and you must hit Ctrl-M to move it within the outline.

■ Although it is not what you would call full-featured, PC-OUTLINE has most of the functions of a good personal word processor.

It is difficult within the space of this review to run down all the handy little features that *PC-OUTLINE* includes. As an outliner, it shows or hides as much of the entries as you ask; automatically renumbers entries that are moved; has a Title toggle that will erase the number from an entry (thus removing it from the outline structure); and includes a system you can use to mark entries and then copy, move, promote, or indent them en masse.

Although it is not what you would call a full-featured word processor, *PC-OUTLINE* has most of the functions of a good personal word processor, including a context-sensitive search-and-replace function, a well as the capacity for print formats such as underlining, boldface, and (if your printer supports them) superscripts and subscripts.

WINDOWS However, my absolutely favorite feature—and the one that puts *PC-OUTLINE* high on my list—is its windowing capabilities. *PC-OUTLINE* allows you to create up to nine separate windows using either the same file or separate files. Each window starts out full-screen and then can be reduced horizontally and moved along the length of your screen. You toggle between windows by using the Alt key in combination with the number keys on top of the keyboard. For example, at one point I had two outlines occupying two visible half-screen windows and a third, half-screen "notepad" window in the background, which I toggled to every time I needed to jot something down. Finally, there is a Zoom function accessed by the gray Minus key that will toggle your current window to full-screen size.

Of course, *PC-OUTLINE* has its share of bugs, most of them small but irritating. For example, if you want to copy an entry, the program refuses to place that copy directly after the original—you have to place it somewhere else in your outline and then move it separately. There is also a slight quirk that asserts itself when you copy or move a block from window to window—the text is automatically "demoted" one level below the entry it has been placed under, rather than simply added as the next entry in that level. And there is no header/footer function for printouts, which I consider a fairly major omission.

Finally, *PC-OUTLINE* in its present form supports only a limited number of printers. It has a quickly accessible printer-code file, but you'll have to go to your printer's manual in order to adjust for your personal formatting needs.

But these are very small problems indeed, considering the general slickness of the overall product. In comparison to its other, "professional" competitors, *PC-OUTLINE* is definitely one of the front-runners—and when you take price into consideration, this is one little program that surely takes the prize.

—Barbara Krasnoff

READY!

Produced by Living Videotext, the makers of *ThinkTank*, *Ready!* is an efficient tool for making outlines, jotting down notes and ideas, dialing phone numbers, and generally organizing the details of your life. The resident outline processor is a tidy desktop alternative to errant pieces of paper and clunky appointment calendars.

Although *Ready!* shares many *ThinkTank* commands, it wasn't developed to be a resident version of *ThinkTank*. Instead, *Ready!* was designed as an auxiliary program—a kind of never-ending scratchpad. Press the Ctrl key with the numeric pad 5. *dBASE III*, *Microsoft Word*, or whatever program you're in is frozen, and *Ready!* pops up. Press the toggle switch again and you're back where you were. I tried *Ready!* with *WordStar* and *1-2-3* and was able to jump back and forth quickly, without any lag or problems with my data file.

■ Ready! was designed as an auxiliary program—a kind of never-ending scratchpad.

Ready!'s simplicity is its strongest asset. The simple format lets you create and define applications according to need. *Ready!* can dial phone numbers, form a daily calendar, and transfer notes to word processors and worksheets. If you take the time to load an outline with information you often use, *Ready!* can be a quick reference source. To push you in the right direction, Living Videotext included an ASCII table, ZIP code directory, and list of U.S. state abbreviations on the program disk.

Ready! is very easy to use. Since I'm a pretty fair typist, I used first-letter abbreviations to call up menus, but the program also responds to pressing function keys, pressing Enter to acknowledge the highlighted bar cursor, and pointing if you own a mouse. The cursor is controlled with the

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CIRCLE 365 ON READER SERVICE CARD

cursor keys or *WordStar* Ctrl key combinations, but their use is confusing. Although the natural inclination is to use the Cursor up and Cursor down keys, these only move the cursor around on the same outline level, skipping sublevels. It's the Cursor left and Cursor right keys that move up and down the entire outline. You can also scan your outline with the Window command, which scrolls the text, although the hoist and collapsing features make the command almost unnecessary.

The command menus, accessed with the F10 or slash (/) toggle key, display function choices at the bottom of the screen. Although you could probably load *Ready!* and start to work without immediately referring to the documentation, the slim manual is worth reading.

You build an outline by inserting headings and subheadings. The headlines can then be changed, alphabetized, copied, transferred, printed, or deleted. The Undo command will restore the deleted headlines but won't insert them in their previous position. You can concentrate on a particular level by collapsing the headlines or hoisting, which treats your selected headline as the initial level. Expanding and dehoisting is the opposite process, for more extensive viewing.

■ Ready! can dial phone numbers, form a daily calendar, and transfer notes to word processors.

Ready! doesn't have a separate calendar function. You can, however, use the template provided or create your own daily calendar with the outline processor.

You build templates, or use any of the templates that come on the program disk, to save typing. By naming outlines that you use frequently, such as the calendar, for a function key, you can automatically bring them up by pressing the corresponding key.

Ready! can transfer outlines to other programs. Setups for over 20 programs, such as *SideKick*, *Symphony*, *Framework*, and *dBASE II* and *III*, are included, along with instructions for creating others.

The elementary word processing features are very limited. Unlike its predecessor *ThinkTank*, *Ready!* does not offer any text entry other than the actual outlining program. The edit mode allows you to build outlines or jot down notes and expand them to a rough draft, but that's about it. Since *Ready!* enters all its text as individual headlines, any extensive word processing is awkward and cumbersome. For instance, to correct a typo in the line above the one I was typing, I had to first finish the line, exit insert mode, go into edit mode, correct the typo, exit edit mode, and press insert again to continue. But then, *Ready!* makes no claims to be a document editor or word processor.

Ready! is a competent outline processor, but it isn't perfect. For instance, the memory limit for an outline is only 32K. In addition, an outline isn't automatically updated when you make changes to it. When you open the outline, a copy is read from disk to memory. Your work is kept in memory. You can save the updated outline only by giving it a new name (thus creating a new outline) or by using the "replace" option to replace the original with the updated version.

Outline processors can sometimes be more trouble then they're worth. However, since *Ready!* is flexible and speedy, it could make your life easier. If you're a compulsive list maker, can never find your address book, or find details getting out of hand, you could be ready for *Ready!*

—Christina Dyar

EXPANDED FACT FILE

Ready!

List Price: $99.95

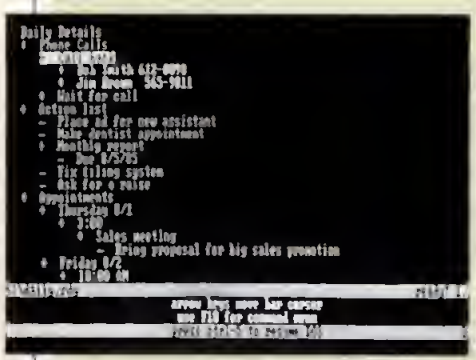
Living Videotext
2432 Charleston Rd
Mountain View, CA 94043
(415) 964-6300

Requires: 128K RAM, one disk drive, DOS 2.0 or later.

CIRCLE **684** ON READER SERVICE CARD

FORMATTING FEATURES FOR FINAL TEXT
Paragraph Formats: JL
Margins: LM:1, RM:77, AI
Line Spacing: LS:3
Character Formats: BO, UL, ASC
Page Formats: LP:99,9
Tabulation Format: TL, TR

EDITING SCREEN DISPLAYS
Noutext Display: DF, DA, TI
Text Display: SL:66, SC:77, WA



Although Ready! *shares* ThinkTank*'s general format and many of its commands, it has been simplified into an efficient outlining and note-taking tool.*

TEXT ENTRY AND EDITING
Typing/Editing: FC, DM
Deletion Formats: CD, LA, PA, DA
Character Features: AC
Cursor Movement: CM, CK, MS, NC, NL, NSC, NPG, BL, BP, BSC, BPG, BD, SU, SD, JC, JL
Block Editing Tools: LN, MV, CP, SW, DE, DF
Search and Replace: FO, CI, WW, AS
Undo Utility: UD

PRINTER SUPPORT
PT, PS

FILE HANDLING
Document File Strategy: DF, ASC, DS:32 KBYTES
Document Saving: NB, MS, EN, ER, EL
DOS Facilities: DR, CDK, ADK, CDR, ADR
File Import and Export: IM, IAL, EAL, EWS

SPECIAL FEATURES
Other: KM, CK, CS, SF, OG, DV, TV, TM, TC

SPECIAL OUTLINING FEATURES
Indented Outline Formats: IL:UNLIMITED, LL, RL, IM, IA, CO, CL, XO, XL
Editing Capabilities: DWS, DOS, PL, DL, MWS, MOS, AL, SK:80, RW:80
Other Functions: MO, EO, IO, LO, EW, RW, NP
Hard Copy Formats: HI:UNLIMITED, HL

THINKTANK 2.1

A good outline, like a well-executed lay-up shot in basketball, always looks easy to do but really isn't. Some software companies have recognized that problem. The result is a fleet of outline processing programs that specifically address the problem of getting organized.

Living Videotext Inc. of Mountain View, California, offers *ThinkTank*, an outline processor and "idea tool" for anyone involved in planning, organizing, and writing large or small projects. *ThinkTank 2.1* is capable of doing just that.

It is possible to use a regular word processor as an outliner, but it's a time-consuming process; normal word processors aren't inherently structured for outlines. What *ThinkTank* does is lock your ideas into an outline format while giving you flexible tools for adding notes, relocating and copying headline listings, and moving text around.

ThinkTank has a simple, straightforward command entry. You can call up the main and secondary command menus displayed at the bottom of the screen with the F10 key, then either point to the commands with the cursor key and hit Enter or press the first letter of the command. The function keys also substitute for entering certain commands.

ThinkTank lets you set up headlines, add subheads beneath them, and move those headings around in the outline. A plus sign in front of a headline or subhead indicates that that particular listing has more information beneath it. The plus sign prefix also indicates that the heading (if not already fully expanded) can be expanded to reveal more text by hitting the Plus key at the far right of the keyboard.

Similarly, a minus sign to the left of a headline or subhead indicates that it has no extra information beneath it. When you are ready to hide subheads to temporarily get them out of the way, you can collapse the listings beneath a heading by hitting the Minus key to the far right of the keyboard.

Headlines and subheads can be edited on a limited basis should you want to change a title. They can be renamed, moved, and even transferred to a new outline file via the port command.

EDITING EXTRAS You can also add what *ThinkTank* calls "documents" beneath the headings. The presence of a document, like that of a subhead, is indicated by a plus sign in front of the heading. The most recent version of *ThinkTank* has fairly flexible word processing capabilities within the document feature. It includes extras such as a Find command to search for patterns in the text and an Xchange command to search and replace up to 80 characters of text. Up to 20,000 characters can be written per headline.

An extra feature in the headline editor and the document editor is the ability to activate *WordStar* cursor command keys, such as Ctrl-X for one line down. The feature can be deactivated by pressing Alt-F4.

Although *ThinkTank* doesn't have complete word processing capabilities, it does allow you to send and receive ASCII text files, a feature accessed by the Port command. Also, the document editor lets you move document files to other headings within the same outline.

The document editor can block out text and then cut, copy, delete, or paste it to other documents attached to other headlines. One recently added feature is called the "clipboard," which acts as a temporary file for whatever text is copied, cut, or pasted. After blocking the text, you can hit the copy or cut function keys and send the text to the clipboard for temporary storage. When you have positioned the cursor at the point in the document where you want to move the text, hit the F4 key and the text will be automatically copied into the new document.

EXPANDED FACT FILE

ThinkTank 2.1

List Price: $195

Living Videotext Inc
2432 Charleston Rd
Mountain View, CA 94043
(415) 964-6300

Requires: 256K RAM, one disk drive, DOS 2.0 or later.

CIRCLE 683 ON READER SERVICE CARD

FORMATTING FEATURES FOR FINAL TEXT
Margins: LM:0, RM:131, AI
Line Spacing: LS:1-3
Character Formats: VP, PW, BO, IT, UL, ASC
Page Formats: GL, GR, HT, FB
Tabulation Format: FC

EDITING SCREEN DISPLAYS
Nontext Display: RC, CC, LN, DF
Text Display: SC:77, WA
Deletion Formats: CD, WE, LE, SE

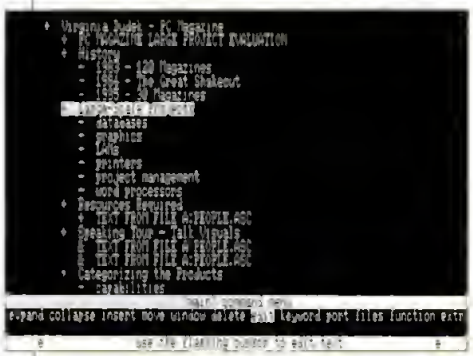
TEXT ENTRY AND EDITING
Typing/Editing: FC, IT, ED, DA, CA
Deletion Formats: CD, WE, LE, SE, PGB, DA
Cursor Movement: CK, NC, NL, NW, NS, NP, NSC, NPG, BL, BS, BP, BSC, BPG, BD, SU, SD, SL, SR, JC, JL, JP, JM
Block Editing Tools: HL, AB, MV, CP, SW, DE, AR, HA
Search and Replace: FO, CS, WW, AS, FS, FR
Undo Utility: UD, RP

PRINTER SUPPORT
NP:40, UP, PT, EO, QU, PS, OF

FILE HANDLING
Document File Strategy: FD, LM, PG, CS, OTH, DS:32 LINES PER OUTLINE
Document Saving: NB, DB, MS, EA, DL, EL, PL, IN
DOS Facilities: MU, CDK, ADK, CDR, ADR
File Import and Export: IM, IAP, IWS, IOTH, EAL, EWS, EOTH

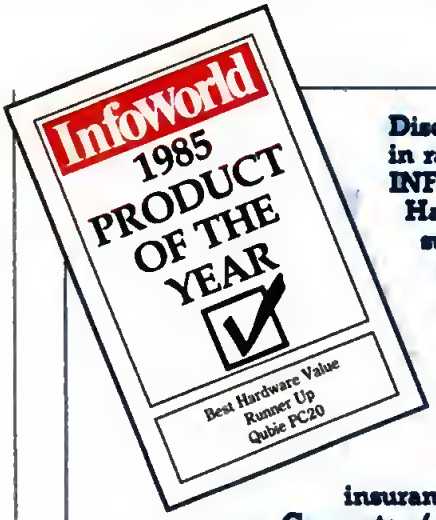
SPECIAL FEATURES
Other: AT, FL, SC, OG, DV

SPECIAL OUTLINING FEATURES
Indented Outline Formats: IL:10,000, LL, NF, RL, IM, CO, CL, XO, XL
Editing Capabilities: DWS, DOS, PL, MWS, MOS, AL, LL, SK:20,000, RW:20,000
Other Functions: MO, EO, IO, EW
Hard Copy Formats: HI:10,000, HL, NF



ThinkTank's latest version contains many new features, such as the ability to pick up and include ASCII text files from outside sources.

Discover what the editor



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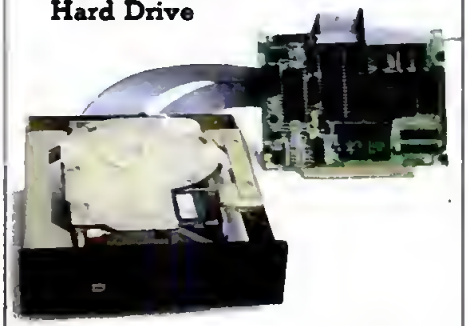

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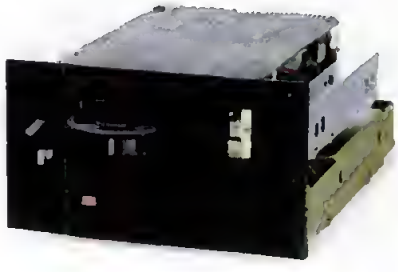
Includes Case With Fan And Power Supply



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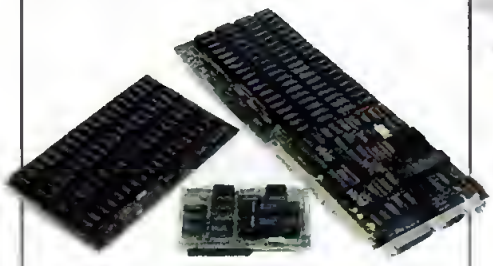

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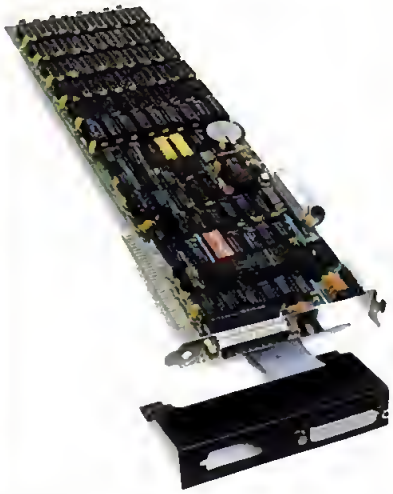

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Department P
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Camarillo, California 93010

CIRCLE 233 ON READER SERVICE CARD

One note of caution: If a new file is cut, copied, or pasted to the clipboard, whatever file is already inside will be overwritten. However, the clipboard's usefulness grows with practice.

Another feature new to *ThinkTank* is the Hoist command. It resembles a windowing facility and is actually very well suited to an outline processor. By positioning the cursor on a headline within the outline that you want to isolate and hitting the Left Bracket key ([), you can view separate sections of the outline. Hitting the Right Bracket (]) key "dehoists" or returns you to the main outline.

ThinkTank has a feature it calls "window," but the window's real job is to let you position the outline in different areas of the screen.

Cloning is another new *ThinkTank* tool. By positioning the cursor over the headline to be cloned and hitting the ampersand key, you clone the headline and its subheads. The ampersand sign in front of the clone marks it as a clone.

■ ThinkTank has been designed to make outline creation easier and less time-consuming.

Changing one clone results in changes in all other clones, even if they are collapsed from view. Although you can copy a headline and its subheads, copies of headlines do not change with the original. Also handy is a Move command for relocating headlines.

Another way to reorganize ideas within *ThinkTank* is with the Mark and Gather command. First you mark a listing by positioning the cursor in front of the listing and hitting the Tab key. You can mark several items, then hit G to execute the Gather command. All of the marked listings will be gathered under a new heading called "gathered outlines." You can rename the headline with the headline editor.

Color is also available in *ThinkTank* starting with Version 2.0. You can control the color of the command line bars, background, and highlighted and unhighlighted text.

ThinkTank has an "options" feature that lets you control how your work is saved. The Fast + Dangerous option will write changes to the disk only when it needs to make room for new or expanded text. Remember not to remove the *ThinkTank* disk when in Fast + Dangerous mode, because doing so could damage your data files. Fast + Dangerous is intended to run significantly faster, but you can avoid the pitfalls by opting for Slow + Safe.

Once you accept the fact that *ThinkTank* is designed to make outline creation easier and less time-consuming, you can overlook its quirks. The cursor movement between headlines is not intuitive and takes getting used to. The "beep" and the display message are there to tell you that you "can't go left!" but they can be annoying. However, the restrictions are designed to keep you and your ideas organized.

One difficulty to watch out for is *ThinkTank*'s problematic installation and copy protection schemes. This writer, as well as other editors at *PC Magazine*, experienced program disks that died after being reinstalled or that wouldn't start up ever again after being incorrectly installed and then reinstalled, and some that just never got off the ground. Read the installation instructions and the different requirements for floppy and hard disk systems carefully before you start.

The README.DB file on the Version 2.1 program disk is also essential reading. It offers useful information on program enhancements and corrections, and tells you that a non–copy-protected version of *ThinkTank 2.1* is available for an additional $40. Free backup program disks (copy protected) are available when you send in the registration card.

ThinkTank has the basics that any manager, writer, or planner needs to write an outline. It's not a fully stocked word processing and editing tool, but then *ThinkTank* claims to offer only the essentials of outline processing. Its features give you just enough tools to organize your thinking and create well-formatted text.

Living Videotext president Dave Winer has termed *ThinkTank* an "intellectual bag lady that you can use to carry everything around with you." This comparison may not draw attention to *ThinkTank*'s many pluses, but if you know how to use it, it can carry quite a bit.—**Virginia Dudek**

THOR 1.83

Fastware Inc. describes *THOR 1.83* as a thought organizer. This designation aptly points up the distinction between a text database such as *THOR* and an outline processor. An outline processor is like a wooden house, with the walls suspended from a supporting frame; the outline is the frame and you hang developing ideas on it. A thought organizer is more like a brick house, with the walls themselves as the supporting structure; you shape and "fire" your thoughts, then pile them up into an edifice.

IT'S A DATABASE The foundation of *THOR* is a relational database. What promotes *THOR* to the status of thought organizer is a very structured interface that shapes one's use of the database with a witty cerebrative analogy.

In *THOR*, a grouping of related data that would normally be called a record becomes, instead, a thought. Whereas in *dBASE II* you might have constructed a query, you enter a "state of mind" in *THOR*. The database search based on your query becomes the "brain scan."

Once you complete a "thought" (which can be up to 40,000 characters for big thinkers), you are presented with the categorization screen. You don't have to categorize your ideas if you prefer them to be free floating, but this screen gives you up to five categories (primary keywords in computer lingo) with which to impose order on your cogitations. For each category, you can further define the content with a single word (also known as a secondary keyword).

You can ponder your ruminations further by editing them or use the STATEofMIND screen to retrieve pearls of wisdom via combinations of category, content, time period, and up to three matching text

phrases. If you've forgotten what you were thinking about, the BRAINscan function will remind you. You can "collect" thoughts from different categories and "forget" them just as easily, by invoking the associated screen.

You move around these screens using cursor movement keys and specified letters and numbers and move from screen to screen with the function keys.

The Ctrl and Alt keys in combination with letters and the numeric keypad keys comprise *THOR*'s typing and editing environment. The neatest editing feature is the use of the Alt-D key combination for redefining the numeric keys along the top of the keyboard as extended ASCII keys. If you don't know the particular ASCII value, you can choose the character you want from the graphics display. Other Alt key combinations allow you to change the current foreground and background colors of the characters as well as make characters flash.

THOR isn't intended as a full-fledged word processor, but a few refinements would definitely make *THOR* a better "note taker." For instance, when you reformat a portion of text, the cursor should stay where you put it instead of skipping down to the end of the thought and forcing you to go chasing after it. When you are moving the cursor with the cursor movement keys on the numeric keypad, the cursor should wrap at the right margin rather than continuing on to the right edge of the screen. *THOR* should not ask you to count the number of lines to insert, delete, or save, but should do this thinking itself.

THOR's import/export facility sends text between ASCII and *THOR* formats without a hitch, so that you'll be able to port your thoughts to a bona fide word processor to make them completely presentable. You can choose among several options to control what portions of the file are exported. If you know how you would like to categorize your incoming text, you can place parameter lists, which *THOR* calls import control lines, into the text, and *THOR* will organize your thoughts accordingly. *THOR*'s Rebuild facility is useful for reorganizing and compressing files and restoring files that get clobbered. *THOR*'s file handling could be improved with a utility for saving or copying existing files to backup disks; right now you have to exit *THOR* and go to DOS to do this. You also have to do a DOS directory listing to see what's really on your data disk. *THOR* keeps its own directory of the files on the program disk, so there's no guarantee that the two directories will agree.

PRINTING POWER *THOR*'s print function is much more complete than its edit function. It recognizes printer commands, which you designate in your text with a beginning backslash. Along with commands to set top and bottom margins and top of page, there is an Include command to specify category and content names; this provides an easy way to shuffle the printing order of your thoughts and create mail-merge applications. You can also define your own printer commands for each of nine printer definitions. For each definition, you can translate unprintable characters into printable ones and define print attributes.

THOR has one of the most entertaining automatic demonstrations around; its pacing, wit, and color entice you to try the real thing. The *THOR* manual supplements this with a written tutorial that ably introduces you to all the major functions. However, you will still need to experiment with *THOR* to get a good feel for its capabilities. The reference section of the manual is clear enough, but depictions of the various screens would improve it. The manual also needs an index; no program or manual is so well organized that it can do without this basic reference tool. The help screens are context-sensitive to the extent of being specific to the general function rather than to a particular action, but the use of submenus in the help screens makes it easy to find information. If you need human help, you can get quick, satisfactory aid by call-

EXPANDED FACT FILE

PC LABS

THOR 1.83

List Price: $49.95

Fastware Inc.
200 Freeway Dr. East
East Orange, NJ 07018
(800) 372-2345 (201) 676-7963 (in N.J.)

Requires: 128K RAM, two disk drives, DOS 2.0 or later.

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You can use THOR*'s STATEofMIND screen to retrieve your ideas via combinations of category, content, time period, and text.*

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Cursor Movement: SD, NC, NL, NSC, BL, BSC, SU, SD
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Undo Utility: UA

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UP, PT

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File Import and Export: IM, IAP, EAL

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Other Functions: MO, EO, IO, LO, EW, RW, MM
Hard Copy Formats: HL, DF

ing Fastware's 800 number. The technical person on the other end of the line will refer to your particular client log, which Fastware has computerized—on *THOR*.

MINOR PROBLEMS The one area in which *THOR* is weak in handling errors. New users tend to make mistakes, and *THOR*'s response to these errors is to bump you out of the program into DOS. Occasionally, the error message includes a code and suggests referring to the message manual, but the message manual isn't included in the user manual. Although the mistakes tend to decrease as you gain expertise, you can be frustrated during the learning period. To compound the problem, when you reenter the program, *THOR*'s rather unfriendly message implies that the problem lies with you rather than with *THOR*: "You have managed to abnormally exit *THOR*."

A Fastware spokesperson emphasized that *THOR* is not intended to prepare documents or be an outliner. It is a database manager that helps you keep thoughts separated yet related enough so that the thoughts can be found. Nevertheless, *THOR*'s method of organizing and ordering thoughts could be more flexible. In *THOR*, the hierarchy of organization from the bottom up is thought, content, category, and application file or database. When you request a list of the categories, they will appear in entry or alphabetical order, depending on the method you use to request them. But there is no means for numbering or sorting the categories. Similarly, you can select and order thoughts temporarily by collecting them and put thoughts or categories into any order at print time, but there is no means of reordering the categories to last beyond the current use of *THOR*. *THOR*'s value as a thought organizer would also be increased if it offered a way to display an overview or a summary of the structure you've created in your database.

The other enhancement *THOR* needs is the streamlining of some of its procedures. Saving a thought or a category is a two-step process, requiring that you press Esc, then Confirm. Saving all or part of a thought to a new thought cannot be done directly; you must save the text to an interim file.

Following the Borland approach to marketing, Fastware has recently reduced *THOR*'s price to $49.95. *THOR* is especially useful for people who write or think in short spurts or in a stream-of-consciousness fashion. If Fastware also gave *THOR* the capability to summarize the contents, as outline processors do, *THOR*'s usefulness would double and its audience would, too.—**Stephanie Stallings** ■

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CIRCLE 122 ON READER SERVICE CARD

FACTORING TRAINING INTO THE PC EQUATION

When you buy PCs and software for your employees, don't forget to put training into your budget. This essential commodity is what will make your other purchases productive.

Corporate managers are beginning to face a fact that individual PC users came to terms with a long time ago: Training is an essential PC peripheral. When you place computers and copies of *dBASE II* or *1-2-3* on your employees' desks, you must provide training as well. In some offices the training process is natural; experienced users tutor novices on a casual basis. In most companies, however, staff people are too busy to devote time to training their colleagues.

When *PC Magazine* last focused on training (Volume 4 Number 16), we discovered an interesting trend: While many large companies were taking an active role in training their employees, arranging courses and spending money on custom-tailored seminars, smaller companies were more likely to rely on employees to get the training they needed on their own.

This time around, instead of looking at the differences between small and large companies, we've divided the training spectrum into two other universes: training centers that employ instructors and hold classes, and training software that turns the PC into the instructor. We set out on this project with some preconceived notions, expecting to find that large companies most often used seminars, while employees of small companies used training software to teach themselves. Our findings are not quite so clear cut.

Large companies do frequently use the services of training centers. They can afford customized courses and have enough employees needing training to populate entire classes by themselves. But small companies are also investing in seminars, sending individuals or small groups to courses located at training centers rather than bringing instructors on-site.

At small companies where only a few employees need to be trained, perhaps each in a different application, training software is a popular solution. But large organizations like NASA and Procter & Gamble are using these packages too, combining them with other forms of training to reinforce skills.

Perhaps a more interesting contrast than large versus small companies is the differing availability patterns for these two modes of training. The choice in training software, we found, boils down to three companies whose products are available all over the country. On the other hand, hundreds of independent training centers proliferate; the ones we found are just a few examples. You'll have to do some research to find a good one in your area.

—Lisa Kleinman

THE PC PLAYS TUTOR

When you need to learn an application fast and on your own, third-party tutorials from one of the three major vendors could be your ticket.

Most commercial software comes complete with binders full of useful information, reference material, and often a tutorial—occasionally even a disk-based tutorial. But even with all this instruction, many users still have difficulty learning applications as quickly as they would like. Anyone who knows how to operate a personal computer will eventually figure out how to use the software, but learning rapidly is often crucial, especially in a corporate setting.

That's where third-party applications training software comes in. These packages can teach you how to use most popular programs, from *1-2-3* to *WordStar*. From manufacturer to manufacturer, the approach to training may differ, but each package is designed to train you effectively and quickly.

If these packages are geared to a specific market at all, it's the corporate user. A manager who needs to complete a financial report to meet a deadline doesn't have time to sit down with a newly purchased copy of *1-2-3* and its manual and work through them in an orderly way; that method could take days. A well-designed training package can get executives up and running fast.

THE APPROACH Just three companies heavily dominate the training software market: CDEX Corp., American Training International, and Individual Software Inc.

CDEX's programs start with the assumption that you know absolutely nothing about DOS. The people at CDEX believe that many users never want to open a DOS manual and would rather be taught the minimum number of DOS commands necessary to get right to the application itself. Those proficient with DOS can skip the novice sections and proceed to more-advanced training in the use of the application itself. CDEX's *Expert* series allows the training software to reside with the application in memory. A tap on a single key moves you back and forth between the application and the training program.

CDEX software is designed to go much further than software tutorials like the one supplied with *1-2-3*. CDEX claims that its software is more comprehensive and uses many more screens and more color. Instead of just pushing buttons and watching the Lotus tutorial enter the information, you have to *do* something—and action reinforces learning.

American Training International (ATI) takes a slightly different approach. ATI's courseware designers believe that the material applications software manufacturers publish often goes into too much detail too quickly. ATI products concentrate on the important aspects of the program and fully emulate the screens that appear in the application itself. A convenient result is that you need not actually buy the application to use the tutorial—in fact, you can see how a product performs before deciding to buy it. ATI also believes that skills should be taught first; the knowledge and information required to use the application intelligently then become a subset of those skills. According to the company, in a study designed to compare various training programs, ATI products took half the time to get users to the same skill level as did the other packages in the study.

Individual Software Inc. spokeswoman Diane Dietzler says that her company's

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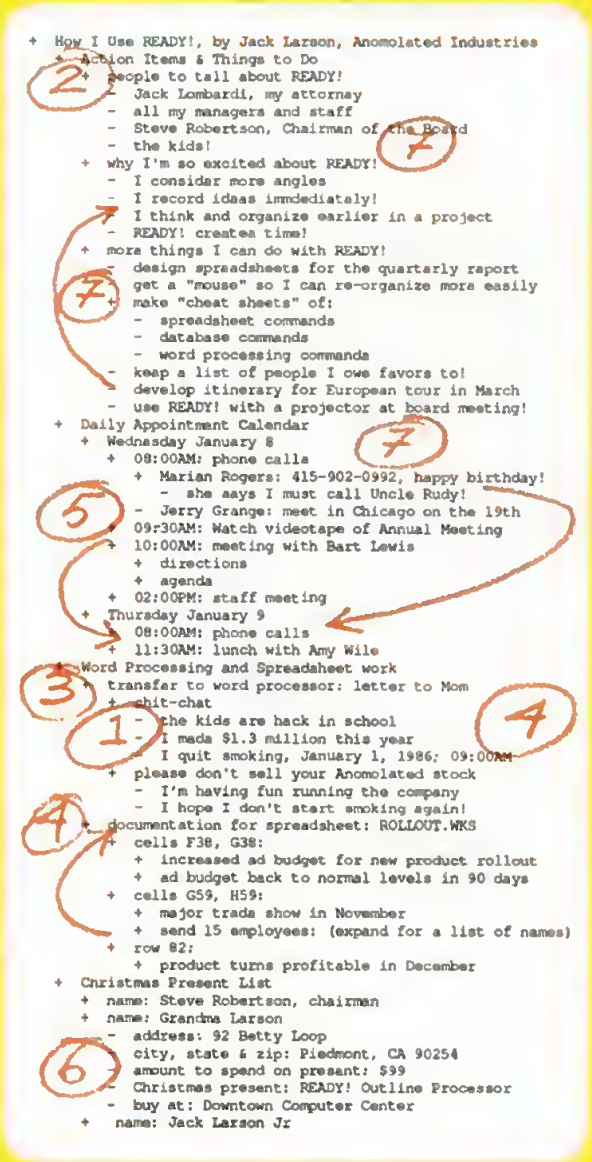

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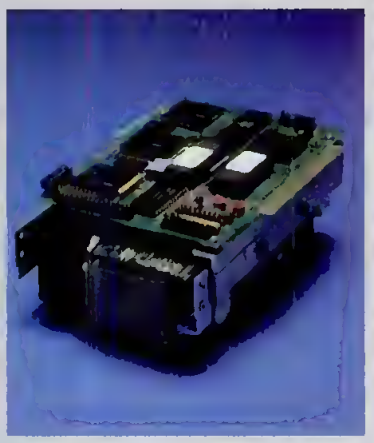

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■ TRAINING SOFTWARE

products guide you through the software in a flexible, interactive manner, letting you explore each application at your own pace. "We cover *1-2-3* better than the Lotus tutorial, because the Lotus tutor just has you push a lot of buttons," says Dietzler. Individual's submenus let you get to different areas of the training software quickly, and spreadsheet data is already entered—all you have to do is manipulate it. All Individual Software programs are self-contained emulations of the programs they teach; they do not need the primary programs to run.

COMPUTER VS. HUMANS The manufacturers of all these training programs maintain that their products can compete with instructor-taught training sessions. CDEX stresses the "total learning environment" that its products create; users who take training classes, says CDEX, must still rely on the documentation for reference. ATI considers its products better than a classroom environment not only because of their own inherent value but also because the "ideal" classroom environment does not exist. Personal interaction is always best, ATI admits, but unpredictable factors such as class size and inferior instructors can inhibit learning.

SITE LICENSING One way to judge how effective such packages are is to look at the corporations that use them. Individual Software says that companies such as Control Data Corp., Chevron, and Tektronics are using its products. Individual offers site-licensing agreements for a minimum of 75 copies, with discounts from 25 to 30 percent. CDEX sells its products to McDonnell Douglas, AT&T, and Pacific Bell and offers customized site-licensing agreements.

Annette Rostetter, assistant program manager for the NASA Learning Center, is one satisfied user of CDEX training software. "We've used it to train everyone from aerospace engineers to secretaries very efficiently," she reports. "It handles varying levels of experience quite well. We use the CDEX *1-2-3* training package, but as a prelude to that, we have our employees view a videotape from another company that addresses the same subject. The two in conjunction work very well."

ATI's customers include Procter & Gamble, General Motors, Exxon, Xerox, and IBM, as well as the Department of Defense. It offers site-licensing agreements for up to 250 terminals at a 25 percent discount and for over 250 terminals for 30 percent off the retail price.

FUTURE SHOCK The "Big Three" training software manufacturers all claim that user responses to their products have been positive. The number of manufacturers in this field, however, has dropped significantly in the past few years. Companies such as Comprehensive Software Inc., Houghton Mifflin, Reston Publishing, Witech, Courseware, and National Training Systems are no longer distributing applications training products. The shakeout took place because too many packages were competing for too small a market, and, in some cases, the manufacturers were not offering anything unique or substantially different from the application's own documentation or disk-based tutorial.

The lessons the survivors have learned are likely to be reflected in the products they release during the next few years. Many experts agree that future training products will have to be more than simple disk-based tutorials. "Intuitive" products incorporating artificial intelligence techniques will no doubt play a major role, but other techniques may offer even more promise.

Two-way, live classroom interactive learning via satellite is one possibility. MicroAge Computer stores are currently experimenting with such a system for their personnel training courses. This type of system could be developed for large retail establishments and training centers. In effect, students would be taught in real time by expert instructors many thousands of miles away. This approach combines personal instruction with computer interaction, offering the student the best of both worlds.

Other more down-to-earth techniques could involve interactive optical videodisks or CD-ROM drives connected to the user's computer. Because such devices offer both moving and still video images and interactive instruction, they could guide users step-by-step through as many exer-

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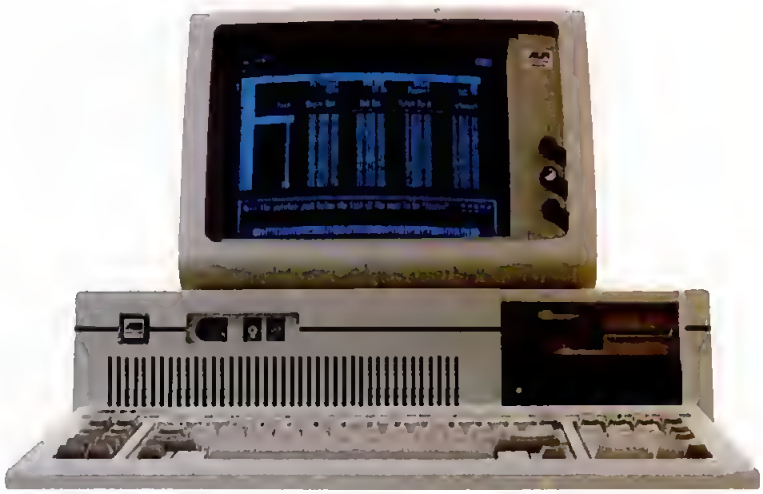

ALR System 286

con•fi•dence/kan'fəd-ən(t)s/1: the quality or state of being certain: 2: the assurance of a THIRTY-DAY MONEY BACK GUARANTEE 3: having a full ONE YEAR WARRANTY on an entire system 4: meeting the **UL Safety Standards** and complying with the **FCC Class B** regulations.

con•clu•sion/kan'klu-zhan/1: to reach as a logically necessary end by reasoning 2: advanced technology, ALR System 286 **at $1,995** - a compatible, competitive, complete system plus the confidence of the ALR guarantee.

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cises and simulations as they needed to master the software. Laser video (LV) systems are already being used for training by government departments and large corporations worldwide. An LV disc holds as many as 54,000 frames per side, more than enough for any training endeavor. Add two channels of audio and you have a nearly perfect vehicle for training. CD-ROM is probably more accessible to PC owners, who are less likely to have an LV player than a CD-ROM drive. These drives are becoming more and more popular, and they also offer mass storage and audio.

A handfull of companies are producing training videotapes that make use of a piece of equipment found in many more households: the VCR. Unfortunately, hands-on learning isn't possible with the VCR alone.

■ The number of training software manufacturers has dropped significantly in the past few years.

A final option that has been tried involves making learning a game rather than a chore. Typing tutors have done this for years, but the first product that makes a game out of learning an application is *Templates of Doom*. Solar Systems Software's president and CEO, Peter Antoniak, originally designed the program as a game for *1-2-3* owners. He then came up with the idea of adding help menus and four levels of hints. According to Antoniak, *Templates of Doom* is like a James Bond adventure. "The scenario challenges you on each of the 16 adventure templates to discover the secret of each template," Antoniak explains. "Each template teaches a new skill through an adventure. More-advanced users are clocked for time. The program assumes a working knowledge of *1-2-3*, but this knowledge can be acquired by going through the Lotus disk tutorial. Basically, *Templates of Doom* is a template that works with the Lotus environment. The program doesn't go into detail on everything, and so users will still have to read some reference material, but they can also go in and see how I created the macros that run *Templates of Doom*."

Templates of Doom is structured for use in a classroom environment; the templates can be separated from the game and used as a training aid or for homework assignments.

Most users—and training managers—

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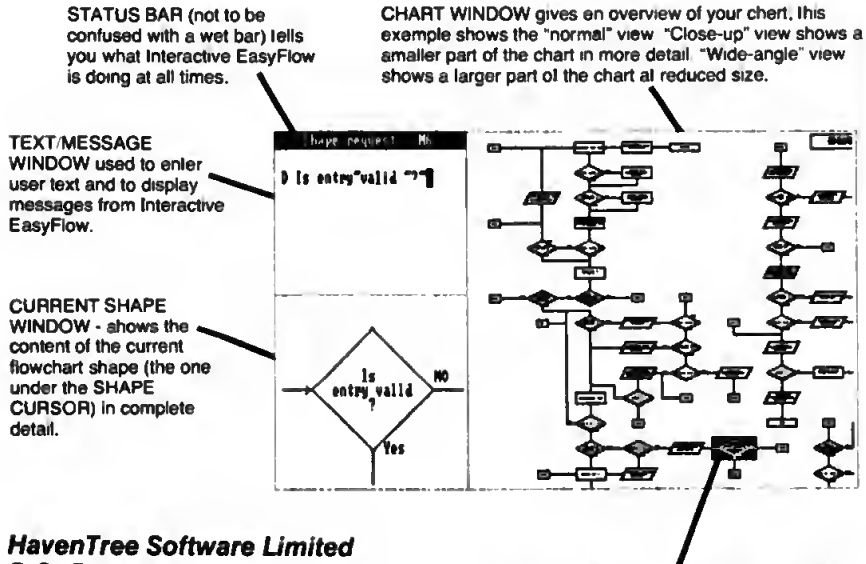
The sample screen display shown below is typical of what you see while editing a chart. Other screen displays are provided for entering titles, changing options, getting "help" and so on.



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■ TRAINING SOFTWARE

would agree that the best way to learn a new program is by using it and reading the documentation. Unfortunately, the demands of a busy office combined with the obtuse writing in most software manuals makes additional training a must. When you consider convenience, privacy, and price, training software is an ideal choice. ■

Dawn Gordon is a free-lance writer in the consumer electronics and computer industries and "electronic editor" of CompuServe's Consumer Electronic Forum.

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ATI
12638 Beatrice St.
Los Angeles, CA 90066
(800) 421-4827
(213) 823-1129
Needs primary software? No
Sample products: *Teach Yourself dBASE III*, $75; *Teach Yourself Lotus 1-2-3*, $75; *Teach Yourself Microsoft Word*, $75; *Teach Yourself Home Accountant*, $49.95
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CDEX Corp.
1885 Lundy Ave.
San Jose, CA 95131
(800) 982-1213
(408) 263-0430
Needs primary software? Yes
Sample products: *Advanced Training for Lotus 1-2-3*, $99.95; *Computerizing Your General Ledger/Peachtree General Ledger*, $99.95; *CDEX Training for the WordStar Program*, $124.95; *The Expert Series Program for Symphony*, $124.95
CIRCLE 661 ON READER SERVICE CARD

Individual Software Inc.
1163-1 Chess Dr.
Foster City, CA 94404
(800) 331-3313
(415) 341-6116
Needs primary software? No
Sample products: *Individual Training for Lotus 1-2-3*, $69.95; *Individual Training for dBASE III*, $69.96; *Individual Training for Project Management*, $69.96
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Solar Systems Software
8105 Shelter Creek
San Bruno, CA 94066
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Product: *Templates of Doom*, $34.95
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SHOPPING FOR SEMINARS

Arranging training sessions that introduce beginners to computers or hone the skills of advanced users is becoming a necessity for many companies.

When the Internal Revenue Service decided it was necessary to teach its employees how to use its newly installed IBM PCs, Carl Ambuske, chief of the Data Management Staff at the IRS's Buffalo district office, thoroughly investigated local computer training centers.

Bearing in mind the programs currently in use in the company's mainframe systems, the wide range of corporate levels that needed to be trained, and the department's budget, Ambuske amassed great piles of brochures, course descriptions, and rate sheets, then targeted the training centers that held the most promise for a tryout session.

The one that Ambuske ultimately selected was the Rochester and Buffalo, New York–based Logical Operations, a 3-year-old computer-training company owned and run by Barry M. Keesan. "What attracted us was the fact that Logical offered courses in all the software packages we were using, that they had basic and advanced seminars, and that the folks giving the courses were effective communicators, not bit-and-byte types," says Ambuske.

The 1-day format of the majority of classes also appealed to Ambuske. "The classes were short but value-packed; each student had a computer; and there was a roving instructor to help students out around the classroom," reports Ambuske. So glowing were the notices of those who trained with Keesan's instructors that 80 IRS employees, from "the lowest-level clerk to everyone but the CEO at the district level," have been trained by Logical Operations over the past 18 months, according to Ambuske.

The curriculum at Logical includes no fewer than 19 different workshops, ranging from an Introduction to DOS workshop to a 2-day course in the *Harvard Total Project Manager*. The $230-per-person cost of a full-day workshop also buys the student a continental breakfast and lunch. Even after the course is completed and the student is computer literate, Logical offers phone support to its clients, free of charge.

INFILTRATED BY PCs William Clark, assistant vice president of Personnel Development and Training at Chicago and Northwestern Railroad, chose a route similar to Ambuske's when he found his company, which had run on a mainframe system, suddenly infiltrated by people who had "bootlegged their own PCs into the company," according to Clark.

Once the PCs began appearing regularly, people started picking up their own training. When Clark got wind of this, he thought, "Let's see if we can do something about it." After scouting out other computer-training centers and seminars, he chose Computer-Based Education Systems (CBE) in Chicago.

"We decided on CBE on the basis of three factors," explains Clark. "CBE was able to tailor applications to what we were doing; it specialized in *1-2-3*—a mainstay for us; and their teaching style was great. The people who took the classes gave very positive reviews."

All levels of management underwent CBE's training. Clark estimates that so far 128 employees, from secretaries to a senior vice president, have taken classes—with a backlog of 180.

While Logical Operations' seminars take place in the training center's offices, CBE brings its courses on-site. CBE president Franz Fauley sends instructors to lead hands-on seminars, accompanied by an entourage of ten Compaq portables. "There are usually ten people per class, with a maximum of two per terminal," says Clark, who forms classes by sending letters to department heads within the company, telling them of upcoming seminar dates and asking them to select employees who they think should attend, in order of priority.

CBE, founded in 1979, emphasizes the "design and development of custom-tailored computer-based training courseware," according to the promotional packet put together by Fauley.

Besides customizing courses for his clients, Fauley is often asked to do preliminary research and consultations. For example, CBE recently undertook a feasibility study of computer usage and training for the *Chicago Tribune*. Fauley will factor the cost of this research into the price of the training.

THE CAR-POOL CONNECTION Finding a good training seminar was easy for Robert Perkins, head of the Financial Management Division of Boston's Shawmut Bank. His car-pool partner told him about a course that his entire staff was taking.

Perkins's driving buddy was Tom Flaherty, then assistant vice president at New England Telephone. Flaherty, who designed and ran an information center at the telephone company, had enrolled his staff in classes at the Executive PC Education Center to teach them how to use their brand-new PCs.

Perkins enrolled in a 2-day beginners' word processing class at the Executive PC Education Center. He then sent 15 Shawmut Bank employees, most of them in supervisory-level positions, to the training classes. "We were able to find people who took to it like a duck to water," says Perkins. "Many took beginners' courses in *Symphony* or *MultiMate*. We also had a person in charge of PC training at the bank consult with us to decide which courses were best to take. Since then, we have a PC committee meeting every month, and we try to keep up to date."

AN IBM ALUMNUS The Executive PC Education Center was founded in 1983 by Trisha Warringer, a former IBM employee who claims to have been one of the first people in this country trained on the IBM PC. She left IBM to found her own training company when she foresaw the great need that the PC would create for formal-

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ized training seminars.

Today, the Boston-based Executive PC Edueetion Center boasts three offices and a growing roster of clients. In e recent class at the Boston office, several employees of the U.S. Court of Appeals were assembled in a large airy room filled with the gentle hum of computers and the aroma of fresh coffee, learning the basics of *1-2-3*.

Students sat one per computer, while the instructor gave the class an overview of keyboard functions, then led them in exploring graphics options with the aid of a projector, a screen, and individual materials. The students had their own printers next to the machines they worked on.

The instructor of this course was Tom Flaherty, who had retired from New England Telephone and is currently the director of finance and administration for the town of Lynnfield, Massachusetts. Flaherty is also a part-time instructor at the Executive PC Education Center.

"I'm a major supporter of training," says Flaherty. "I found through both my jobs that the value of a computer was enhanced immeasurably when the people using it underwent training. You simply can't place e manual in front of a person and tell him to teach himself."

An interesting aspect of computer training, says Flaherty, is the area of executive training. "When we think of computers in the workplace, we think of secretaries with word processors, but we don't often think of the department manager and his use of the PC. The executive doesn't have to know all the intricate functions a computer can do, but he can learn how to use the information that a spreadsheet contains, for example, to help the department manager." The problem, however, is getting the executive to sit down and learn to use the computer. Many, says Flaherty, are intimidated by the machine. Most haven't typed in years and aren't used to a keyboard. "I saw it in my own businesses," says Flaherty. "The middle and higher-level management had PCs, but they never got to use them."

TRAINING THE EXECUTIVE Joe Hannigan, manager for human resources planning and development et Moore Business Forms in Chicago, fought this problem et his company. "We have PCs in the offices of our executives, and aside from our current president, they haven't gotten into it. These are people," explains Hannigan, "who have been successful without this new technology, and they see no reason to learn it now."

Because of the executive's tight schedule, he or she "is not likely to sit down and undertake a new project," says Hannigan. "It's a real challenge for those of us in

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■ TRAINING SEMINARS

training to get the executive involved."

Other levels of management have responded positively to the training, reports Hannigan, who chose Computer-Based Education Systems after investigating several possibilities suggested by the company's computer vendor.

"I took *1-2-3* training with Franz Fauley," says Hannigan. "It was a 2-hour-per-day, 5-day-a-week session offered in four different 2-hour blocks throughout the day. The schedule appealed to me because we didn't have to take people away from work for 2 solid days. In retrospect, we feel this was a good decision."

A crucial deciding factor for Hannigan was the attitude of the instructors. "I enjoyed their presentation; they were supportive and nonjudgmental. I later took an advanced *1-2-3* tutorial and found that the paired grouping at the machines created a very congenial way to get started on a computer. Taking the first step is the hardest of all," says Hannigan, "and if you start with a calm instructor, then the doors are opened to you."

Hannigan's group included a mix of management levels, from secretaries up to an associate director of the company. The director was present mostly because he was sponsoring the program, says Hannigan.

To continue the training process, Moore has established an on-site computer learning center complete with videotaped programs and support staff. Working with materials in the training center has enabled employees who have just taken the CBE course to reinforce what they have learned.

Richard White, a trial lawyer with the Minneapolis firm of Tanick and Heins, is considered an anomaly among his peers because he is computer literate. "In our law firm, we use *Microsoft Word* for word processing. I use the PC to write letters, legal briefs, contracts, and significant lengthy things that I have the option to dictate. I hate dictating, and because it's just not feasible when you're working on a lengthy document, I like to use the computer to do the first draft and then give it to the secretary to revise."

When Tanick and Heins decided to convert from its dedicated word processing system to IBM PCs, White realized that none of the operators had any experi-

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Logical Operations
240 East Ave.
Rochester, NY 14604
(716) 262-2226
Sample courses: *1-2-3, dBASE III, Enable, Harvard Total Project Manager, MultiMate, Symphony 1* and *2, Power-Base.*
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Computer-Based Education Systems
13 Acorn Dr.
Hawthorn Woods, IL 60047
(312) 438-8271
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Executive PC Education Center
5 Broad St.
Boston, MA 02109
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Sample courses: *WordStar 2000, dBASE III, DisplayWrite 2, SAMNA+, Advanced 1-2-3,* and *MultiMate.*
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Minneapolis, MN 55427
(612) 541-9424
Sample courses: *Microsoft Word, WordStar 2000, WordStar, DisplayWrite* 2 and *3, R:BASE 5000, 1-2-3* (update)
Cost: Varies with number in class. One person, $40 per hour; 10 people, $150.
Typical class size: generally no more than 10
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Computer Tutor
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New York, NY 10024
(212) 787-6636
Sample courses: *WordStar, TIM III, Smartcom II, Multiplan, 1-2-3, SuperCalc, dBASE III*
Cost: Hourly rate varies with course (for example, $50 for *WordStar*, $75 for *dBASE III*). Rate rises an average of $15 for groups of 4 to 6 persons.
Typical class size: no more than 6
CIRCLE **663** ON READER SERVICE CARD

ence in using the new machines.

"We priced independent vendors and ended up buying our machines from Sears," says White. "After we chose the machines, our first function was to select software. When we went to our vendor and asked for a software demo, he brought in Karen Powlas of Computer Tutors to teach it to us. She did, and we loved her."

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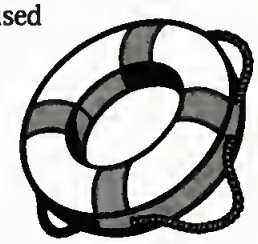

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■ TRAINING SEMINARS

formed, one consisting of "those who knew nothing—the attorneys with no computer experience"; the other, secretaries familiar with word processing. Computer Tutors, based in Minneapolis, trained six people at Tanick and Heins.

Computer Tutors, which began in 1983 doing home-based training and consultation, was bought by Pam Bushman in 1984 and transformed into a mostly on-site training center that emphasized customized training and catered almost exclusively to a corporate clientele.

A beginner's course in, say, *MultiMate,* might take 1 or 2 days of training, but students have the option of taking a 4-hour course to brush up on various functions and paying by the hour.

A CHERISHED TUTOR Classroom-style training, either on-site or at the trainer's headquarters, is typical at most centers. At least one training company, however, persists in doing mostly at-home, one-on-one training. This is the one-man, New York–based firm known as Computer Tutor (no relation to Computer Tutors in Minneapolis). The tutor and founder, Bruce Stark, is cherished by clients such as Sal Attina, a vice president in charge of credit for Banque Indo-Suez.

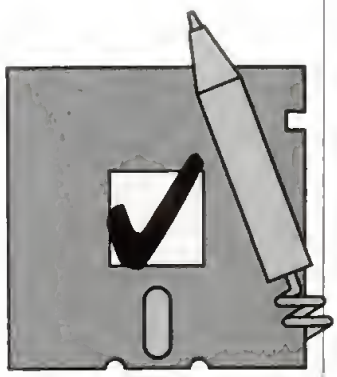
When the bank invested in a number of personal computers to support its mainframe, management realized that no one at the bank knew how to use the new machines. An employee found Stark's listing in the *New York Times*. "Stark started here a year and a half ago," says Attina, " and although we've invested a certain amount of money in the training, we were also able to eliminate the need for a clerical staff and a larger technical staff."

Stark, who is currently teaching a course in database management to the staff at Banque Indo-Suez, has filled a gap, according to Attina. "Looking at the *1-2-3* manual, I realize it would have taken me 5 hours to learn what he taught me in 1 hour. He even carries around a beeper that we are free to call up if we are having a problem. We needed someone like Stark because he's here to teach us, not to sell us anything." ■

Shira Dicker is a free-lance writer based in Boston.

■ PC LAB NOTES: DOS BATCH FUNDAMENTALS ■ TOM SHELDON

DOS TIPS, TRICKS, AND TECHNIQUES



With this issue, PC Magazine *introduces a column dedicated to making as many of our readers as possible as productive as possible.*

INSIDE PC LAB NOTES PC Lab Notes will be a helping hand up the ladder for some users and a refresher course for others. In this column, our editors and technicians will pass along their expertise on topics such as taming DOS, file recovery, the finer points of serial communications, setting up printers, print buffering, managing hard disks, transferring files, and dozens of other useful topics.

Each column will look at a subject in two ways: doing it yourself via DOS or short BASIC, Pascal, or assembler programs; or getting the job done with commercial hardware and software.

The type-it-yourself programs listed in PC Lab Notes will be posted on the *PC Magazine*'s Interactive Reader Service for downloading at (212) 696-0360 as well.

In this first column, Tom Sheldon explains how to create your own batch files that can change subdirectories, select programs, keep logs, and offer file security. Assistant editor David Obregón provides a rundown on the DOS utilities, menu programs, and logging utilities on the market that perform many of the same tasks.

For many users, DOS is like a freeway on-ramp. You see it for only a few seconds as you anxiously get up to speed and into your program. But the PC's operating system (variously called PC-DOS, MS-DOS, or just DOS) provides a number of often overlooked facilities that can simplify your use of the PC. Starting with the basics, this article will explore some DOS tips, tricks, and techniques for making your computing faster and easier.

INITIALIZING YOUR SYSTEM Every time you boot up your computer, DOS searches for a file named AUTOEXEC.BAT. This file consists, simply, of a list of commands you want DOS to execute without your having to type them in each time at the keyboard. Such commands can be used to initialize various parameters on your system, start a program automatically, and display any desired comments.

The following AUTOEXEC.BAT file is so useful and standard that you may want to install something very like it on every disk you use for system bootup (hard disk users will want to put it in the main, or root, directory).

```
PROMPT $p$g
PATH \;\DOS
DATE
REM Welcome to the System
```

If you have a fixed disk system, the commands above are almost essential initializing operations. With hard disk machines, the first command should set the system prompt so that it always displays the name of your current directory, not just the current drive. That way, when you change from one directory to another, you will always know where you are. (For other custom prompts, see your DOS manual.)

The second command sets the system search path. Setting up an automatic search path is important for anyone who organizes his commands and files by separating them into a number of different directories. The AUTOEXEC.BAT path is simply a list of the directories you want DOS to check into for command and batch file names you subsequently enter before it concludes that you mistyped something and reports, "Bad command or file name." Putting a path in your AUTOEXEC.BAT file thus lets you run programs stored in directories other than your current one. This means that you don't need to waste disk space by keeping duplicate copies of often-needed programs in each of your directories.

In the simple AUTOEXEC.BAT file above there are only two directories on the path. When you enter the name of a command or batch file you want run, DOS will first search the root, or main, directory (signified by a simple backslash), and then the \DOS directory. To keep from cluttering up your root directory, for example, you might decide to put all the files from your DOS disk (except COMMAND.COM, which must always be in the root directory) into a \DOS directory. Suppose, now, that you are in your \LOTUS directory, and having just finished up with one worksheet, you want to copy it onto a diskette before going on to another worksheet or project. You open up a box of diskettes but realize, of course, that they're not formatted and FORMAT.COM is in your \DOS directory. Thanks to the path you specified in your AUTOEXEC.BAT file, however, you can simply stick the blank disk in drive A:, format it, then make your copy, all without ever changing out of your

■ PC LAB NOTES

\LOTUS directory. (You can extend the list of automatically searched directories by adding ;\directory name after the two shown in the example. See the DOS manual for more details.)

The third command in this sample AUTOEXEC.BAT asks for the current date, and the last command simply displays a message. When you use an AUTOEXEC .BAT file, DOS does not automatically ask for the date (and time—which you could add to your file on another line) unless you tell it to do so. The message shown is, of course, optional—but some may be very important, as you'll see.

If your system uses a serial printer (many of the older daisy wheel and more-modern laser printers are of this type), after the DATE command shown in the sample AUTOEXEC.BAT file above, you would add the following two lines:

```
MODE COM1:1200,N,8,1,P
MODE LPT1:=COM1:
```

You would change the 1200-baud rate (and the other COM1 parameters) shown above to conform to the specifications shown in your printer manual. In addition, if you wanted to connect a modem to a second serial port (assuming your machine has two), your AUTOEXEC.BAT file should then contain the line

```
MODE COM2:1200,N,8,1
```

Again, you might have to change the baud rate and other parameters to those appropriate for your modem. And if you have recently started doing your work on a color monitor and your PC's internal switches are still set to "wake up" with the monochrome display, you could add the line

```
MODE COLOR
```

to your AUTOEXEC.BAT file to start you off in color.

STARTING AN APPLICATION If every time you boot up you want to run an applications package—such as *Microsoft Word*—you would put it in your root directory (or in any directory you've put on the search path) and simply substitute the two lines

```
rem Starting Word Program
WORD
```

When handling well-behaved programs, DOS keeps track of the line most recently executed in a batch file, even if a program is started in the middle of the batch file. When you exit the program, DOS simply resumes execution with the next line in the batch file. One use for this facility is to give appropriate messages to novice operators. For example, you might change the two lines inset above into the following:

■ If you have a fixed disk system, these commands are almost essential initializing operations.

```
rem Starting Word Program
WORD
rem You have returned to
rem the DOS level. If you
rem are through for the
rem day, turn the system
rem off.
```

The last five lines will only be displayed after the user leaves the *Microsoft Word* program. Later, when menus are discussed, you'll see how this batch file feature can be used to redisplay menus when you exit a program.

MEMORY-RESIDENT PROGRAMS While you can use AUTOEXEC.BAT to start a specific application every time you boot up, chances are your needs are more varied. Many utility programs, such as *SideKick, Scroll & Recall,* and *ProKey,* can each be given a line in your AUTOEXEC.BAT file so that they load up and are immediately on tap before you enter any specific applications.

Similarly, if you decide to set up a RAM drive (an electronic or "virtual" disk) in part of your PC's memory, your AUTOEXEC.BAT file is the place to initialize and load it. (Some RAMdisk programs, including the IBM VDISK supplied with DOS 3.*x*, are initialized instead through a CONFIG.SYS file entry—DOS looks for any CONFIG.SYS even before it gets to AUTOEXEC.BAT. You must check your DOS manual under the DEVICE Command heading or the RAMdisk program instructions from the appropriate manufacturer for appropriate details.) The sample batch file shown below assumes that an IBM RAM drive labeled "C" has been set up by a command in the CONFIG.SYS file or that your first AUTOEXEC.BAT entry will have been the manufacturer's setup line (SUPERDRV C:/2/U=320 might be typical for an AST SixPakPlus).

```
PROMPT $p$g
PATH \;\DOS
DATE
PKLOAD
PROKEY WS.PRO/R/K-
COPY WS*.* C:
B:
C:WS
```

This AUTOEXEC.BAT file first loads the *ProKey* macro program and then executes the *ProKey* macro routines for *WordStar*. It then copies all the essential *WordStar* files to RAM drive C:, changes the default drive to drive B: (where you presumably have a diskette of *WordStar* files), and executes the *WordStar* program from drive C:. (Note: In order to use *WordStar*—or other similar programs that employ overlay (.OVL) files—in this way, you must be sure you have installed *WordStar* so that it will search for its overlay files on drive C:.)

HIDING COMMAND EXECUTION In all the previous examples, commands are displayed on the screen as they are executed by DOS. For an AUTOEXEC.BAT file, this is perhaps useful, but when you are writing other batch files for novices to use, you may want to use DOS's ECHO OFF command. By placing ECHO OFF on the first line of your batch file, notice of many subsequent command executions will be suppressed. In addition, you can use the ECHO command instead of the REM command to display messages. It's a good idea to include the ECHO OFF at the beginning and the CLS (CLear Screen)

command at the end of most of your batch files to enhance their appearance.

Occasionally, you will find that DOS displays on-screen comments even when you have entered the ECHO OFF command in your batch file. A good example of this is the COPY command, which persists in displaying the message "1 File(s) Copied" or produces a whole list of them. You can suppress this screen display by using the DOS I/O redirection function. What you do in this case is redirect the screen output to the NUL device, the "bit bucket," or device that accepts all output without displaying or printing it. The next example shows the contents of a batch file called COPYIT.BAT that copies files from a fixed disk to a floppy disk, demonstrating how comments can be suppressed by directing them to NUL.

```
ECHO OFF
CLS
ECHO FILE BACKUP
ECHO IN PROGRESS -
ECHO DO NOT DISTURB
COPY C:*.* A: > NUL
ECHO COPY PROCEDURE COMPLETE
```

MENU SYSTEMS Menus can be helpful to both novice and experienced user alike. There are several methods you can use to put menus on your screen.

USING ECHO In the first method, a menu is included in the AUTOEXEC.BAT file. The ECHO command is used to display each line, as you can see in the example that follows. You can try this by creating the following file, called EXEC.BAT, and typing EXEC to run it. (There is no need to boot your system with it named AUTOEXEC.BAT, since it's only an example.) If you're unsure of how to create a file from DOS, read the "AUTOEXEC.BAT" section of the DOS manual, and follow the "Copy Con: filename" technique explained there.

```
ECHO OFF
CLS
PROMPT $p$g
PATH \;\DOS
DATE
ECHO WELCOME TO THE SYSTEM
ECHO .
ECHO THE FOLLOWING
ECHO APPLICATIONS ARE AVAILABLE
ECHO .
ECHO Microsoft Word  (type WORD)
ECHO dBASE III (type DBASE)
```

USING TYPE Using ECHO to display menus is actually very inefficient, and the "ECHO" lines won't create their intended blank spaces if you are using DOS 3.1. I included this technique to help demonstrate a simpler and more efficient method: using the DOS TYPE command.

With this second method, three files are created to form a menu system. These files are named AUTOEXEC.BAT, MENU.TXT, and MENU.BAT. The file MENU.TXT holds the text of the menu. AUTOEXEC.BAT will type this menu to the screen when you boot the system. MENU.BAT, on the other hand, will type the menu to the screen anytime you enter MENU at the DOS prompt. MENU.BAT thus gives you an easy return to the menu after it has scrolled off the screen or been erased by a program.

■ You can further increase the efficiency of your menu system by adding numbered selections to it.

First, create a MENU.TXT file similar to the one shown below. You can create this file with your word processor or EDLIN. It's actually easier to create a short file like this with EDLIN, but if you use your word processor, be sure to save the file as a standard ASCII file without control codes (unformatted). MENU.TXT reads:

```
Welcome to the system.
The following applications
are available
Microsoft Word (type WORD)
dBASE III (type DBASE)
```

Next, alter your AUTOEXEC.BAT file so that its last entry consists of the line

```
TYPE MENU.TXT
```

Now, again using EDLIN or your word processor, you create the file called MENU.BAT.

```
ECHO OFF
CLS
TYPE MENU.TXT
```

The biggest advantage of using this second method over the first is that DOS takes less time to display the menu. You do not have to wait while DOS reads and interprets each ECHO command in a batch file. Instead, one command is used that quickly displays the menu. Two files, however, are required with this method.

AUTOMATING MENUS You can further increase the efficiency of your menu system by adding numbered selections to it. In the next example, each menu selection is preceded by a number. Entering this number will execute a corresponding batch file that starts the selected program. For example, typing a 1 from the menu causes the batch file named 1.BAT to execute. The contents of MENU.TXT now become

```
1.  MICROSOFT WORD
2.  dBASE III
3.  LOTUS 1-2-3
```

Similarly, you create 1.BAT, 2.BAT, and 3.BAT files, using this 1.BAT as a model:

```
ECHO OFF
CLS
WORD
CLS
TYPE MENU.TXT
```

Note that the last line of the numbered batch file redisplays the menu after you exit from the applications program.

OTHER TYPES OF MENUS You can create many different types of menus for your computer, especially if you own a fixed disk system. Some of the most useful menus for beginners are ones that display help messages or DOS command syntax. To display a menu called HELP.TXT (which, of course, you must create), you would use the following HELP.BAT file:

```
ECHO OFF
CLS
TYPE HELP.TXT.
```

If the HELP.TXT file you create is more

■ PC LAB NOTES

than one screenful, you can page it to the screen by substituting the MORE command in HELP.BAT, thus:

```
ECHO OFF
CLS
MORE < HELP.TXT.
```

You can also call other menus from the main menu. This method is useful on a fixed disk system that contains a number of subdirectories. For instance, a selection on the main menu such as 1. BUSINESS SOFTWARE could execute the following series of commands in a file named 1.BAT to transfer the user to the business software directory and display the menu for that directory.

```
ECHO OFF
CLS
CD BUSINESS
TYPE MENU.TXT
```

If you decide to create menus for each of your subdirectories, you'll find it useful to place a selection in these menus that returns the user to the main menu. This selection can be called X, for example, and would execute a batch file similar to the X.BAT file shown below. The third line of the file returns the user to the root level.

```
ECHO OFF
CLS
CD \
TYPE MENU.TXT
```

The fact that batch files can be called across directory levels—assuming you use the PATH command to tell DOS where to find them—allows you to store them all in a single directory, which you might call BATFILES. While you may have to store individual, context-sensitive HELP.TXT files in each of your subdirectories, for example, there is no reason to reduplicate the little three-line HELP.BAT file (shown above) that calls them to the screen. On a hard disk system, the minimum file-size allocation is 4K bytes for a PC-XT (2K bytes for an AT), which means that much disk space is wasted if you unnecessarily duplicate small files.

If you're really feeling ambitious, you could even assign function keys to display the help and menu files. In order to assign keys, you must first load the ANSI.SYS driver file. This can be accomplished by including the command

```
DEVICE=ANSI.SYS
```

in a file called CONFIG.SYS. To assign HELP to the F9 key and MENU to the F10 key, you would then include the following commands in your AUTOEXEC.BAT file.

```
PROMPT $e[0;67;"HELP";13p
PROMPT $e[0;68;"MENU";13p
```

After you've fixed the CONFIG.SYS file and the AUTOEXEC.BAT file, reboot your system to initialize the keys. Now, to display the current menu or help screen, simply press F9 or F10.

PUTTING BATCH FILES TO WORK Batch files can do much more than display menus and start applications. The next set of examples are called utility batch files and are designed to help save you keystrokes and to automate various tasks. Once you understand the principle, you should be able to create your own.

REPETITIVE BATCH FILES DOS 2 and 3 include a GOTO batch file subcommand that can be used to perform various tasks over and over until stopped by the user. I used the UPDATE.BAT file shown below to copy three files onto a set of about two dozen training diskettes for a computer class.

```
:LOOP
REM Place a new disk in
REM the drive
PAUSE
COPY A:FILENAME1.TXT B:
COPY A:FILENAME2.TXT B:
COPY A:FILENAME3.TXT B:
GOTO LOOP
```

The first line of the batch file is a label (identified as such by its initial colon) used by the last line in the batch file to cause the set of commands in between to be repeated. (You must terminate the execution of this kind of batch file by pressing Ctrl-Break.)

Another application for repetitive batch files is to create a set of return-address mailing labels. The LABEL.BAT file listed below prints the address contained in the file ADDRESS.TXT to a label, repeating the process over again for each label until stopped by the user.

```
:LOOP
COPY ADDRESS.TXT LPT1:
GOTO LOOP
```

A sample ADDRESS.TXT file is shown below. This file is designed to print on standard 1- by 3½-inch labels. Labels of this size have enough room for about five printable lines and a sixth line between the labels.

```
JOHN DOE
1985 N. DOS STREET
BOCA RATON, FL
<Return>
<Return>
<Return>
```

UTILITY BATCH FILES You can make using DOS a lot easier by creating batch files that automate many of its features. For example, if you use subdirectories, you can save keystrokes by putting the commands to move to a frequently used directory in a batch file. In the FEB.BAT file below, the CD (Change Directory) command transfers you to a fourth level directory when you type FEB on the command line.

```
CD \MYDIR\WP\LETTERS\FEB
```

The next utility batch file also simplifies repeatedly having to type a long, frequently used DOS command. The batch file acts as a kind of keyboard macro. In DIRDATE.BAT below, a disk's directory is sorted by date (column 33) and sent to the printer via DOS's I/O redirection.

```
DIR 1 SORT /+33 > PRN
```

PRINTER ENHANCEMENTS Setting different type styles on a dot matrix printer can be a chore if you don't remember the proper codes (who can?) or if you have to do it from BASIC. The one-line EMPH .BAT file below sends the proper code (Escape E) for emphasized printing to an Epson or IBM dot matrix printer. This batch file also uses DOS I/O redirection, this time with the ECHO command.

```
ECHO (Alt-155)E > LPT1:
```

Note: To create the code for Escape, shown above by (Alt-155), you hold down

the Alt key, press 155 on the numeric keypad, then release the Alt key. Depending on the text editor used, you may see a cent sign (¢), ^[or ^O on-screen. Using a similar technique, you can create a whole set of these files, each of which sets a different type style. Refer to your printer manual for more details on the exact code needed to set any one type style.

The next utility, called COMPRESD.BAT, shows how you can set a type style, print a file, and reset the printer, all in one set of commands. The first line of the file uses DOS's MODE command to set LPT1 to its 132-column compressed mode. The Alt-number sequences shown in parentheses for the first and last lines of the batch file are entered as explained in the preceding paragraph. The second line uses a replaceable parameter (which we'll discuss later) that allows you to enter the name of the file you want printed. To print a file named MYFILE, you would simply enter COMPRESD MYFILE on the command line. The last line in the batch file resets the printer to its regular mode.

```
ECHO (Alt-15) > LPT1:
COPY %1 LPT1:
ECHO (Alt-155)@ > LPT1:
```

As you create new utilities, you may want to design a menu that describes each of them. This menu would be called UTIL.TXT and would be displayed using a batch file called UTIL.BAT, similar to the procedure used for the HELP.BAT and MENU.BAT batch files described earlier.

DOS I/O REDIRECTION The ability to redirect input/output (I/O) information from and to sources and destinations other than their normal ones was added to DOS in Version 2.0, in March 1983. While this facility has been casually incorporated in several of the batch files discussed previously, it has very wide possible application. By using I/O redirection, you can, for example, detour text that would normally appear on the screen to a file or to a printer. Similarly, you can direct text in a file to a program or to a DOS command. A classic technique uses a file to answer questions asked by various DOS commands such as FORMAT and DISKCOPY. To illustrate, here is the text for a file called NO.ANS:

```
<Return>
N
```

You would use redirection with this simple two-line file with the DISKCOPY command by entering

```
A>DISKCOPY A: B: <NO
```

When the command is executed, the carriage return in the first line of NO.ANS is used when DISKCOPY asks you to press any key to continue. The N is then used when DISKCOPY asks whether you would like to make another copy. By using this procedure, you don't have to sit at the keyboard throughout the whole operation.

LOGGING TIME FOR TAX RECORDS You can use I/O redirection to maintain a log of the time you spend on your system. You begin by putting the following lines in your AUTOEXEC.BAT file after the date and time:

```
DATE >> TIMELOG.DAT
ECHO LOG-ON TIME: >> TIMELOG.DAT
TIME >> TIMELOG.DAT
```

You then create a file called QUIT.BAT consisting of the lines

```
ECHO LOG-OFF TIME: >> TIMELOG.DAT
TIME >> TIMELOG.DAT
ECHO ----- >> TIMELOG.DAT
```

When you boot up your machine with these AUTOEXEC.BAT lines, DOS will prompt you for the "new" time and date; hit the Return key. DOS then creates a file called TIMELOG.DAT, in which it enters the date, the "log-on time" message, and the time. Note the use of the double >>. A single > would open up a TIMELOG.DAT file, but each successive line you directed to it would overwrite the previous one. The double >> tells DOS to append each succeeding line of information to TIMELOG.DAT. You do have to remember to type QUIT when you sign off. This batch file enters your sign-off time and draws a line to separate the on-going time on/off entries visually. You can see your log by entering TYPE TIMELOG.DAT, or redirect it to a printer.

HARD DISK BACKUP LOGS Earlier, under the heading "Hiding Command Execution," I showed how unwanted screen messages could be suppressed by directing them to the NUL device. If you're in the habit (which you should be) of backing up the files on your hard disk, however, the same redirection technique can be used to create a most useful file. Suppose, for example, you backup some data by entering

```
COPY C:\LETTERS\*.*  A: > LETTERS.LOG
```

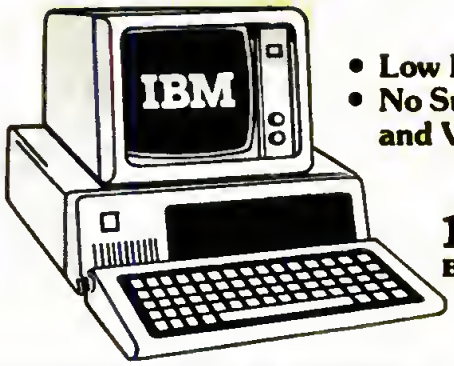
This backs up all the files in the subdirectory and creates a LETTERS.LOG file on drive C: that can serve as a kind of table of contents for the files you backed up on drive A:. This little trick only works when you're backing up more than one file (a single file stores only the laconic "One file copied" message, not its name). As you acquire a number of these .LOG files (which you should give more distinctive names, of course), viewing them can help you find the physical diskettes on which you have stored a needed backup file. And as an even more convenient way of locating the files among your .LOG entries, you might use the DOS FIND command. The single-line FINDIT.BAT file below automates the process.

```
FOR %%A IN (*.LOG) DO FIND "%1" %%A
```

This batch file searches through all files with the extension .LOG in the current directory and displays a list of the filenames of those that contain the keyword specified as a parameter on the command line. For instance, if you were searching for the names of any files containing references to MYFILE.TXT, you would type FINDIT MYFILE.TXT at the DOS prompt. This batch file represents an excellent use of the batch file subcommand FOR and the use of replaceable parameters. The FOR command tells DOS: "For every file in the set (*.LOG), find those that contain the string found in parameter 1 (%1) and display their filenames." The %%A variable, used with FOR in a batch file, sequentially holds the names of the files in the set being searched.

LOCATING FILES IN SUBDIRECTORIES A similar problem in locating files is faced by those with fixed disk systems that contain a number of directories. Locating the directory that holds the file you are looking for can mean a long search unless

Save



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CIRCLE 148 ON READER SERVICE CARD

■ PC LAB NOTES

you use the following DOS trick to find the file. A feature of the CHKDSK (Check Disk) command is its ability to produce a list of the files found in every directory. This list differs from that produced by the TREE command in that it also displays the path for each file. You can redirect this listing into a file instead of to the screen and then use the DOS FIND command to locate files in subdirectories. Since each file is displayed with its pathname as well, you can easily locate the directory in which the file is located. The following command directs the file list produced by the CHKDSK command into the file TEMP:

```
CHKDSK /V > TEMP
```

Now, use the FIND command to locate any file. For example, to locate MYFILE.TXT, you simply type

```
FIND "MYFILE" TEMP
```

Note that you do not need to type the full filename. FIND will locate any substring and display the line in which it resides.

Another way to enter these two commands is shown below. In this example, DOS's piping feature (the key to the left of the *z* key) is used to cause the output of one command (the file list from CHKDSK) to flow automatically into another command (in this case FIND).

```
CHKDSK /V | FIND "MYFILE"
```

USING REPLACEABLE PARAMETERS You've been learning in context about using replaceable parameters in some of the examples above, but this is a good place to discuss them a little more directly. First, a replaceable parameter is a variable in your batch file that is directly replaced by the string you type on the command line when you run the batch file. The variable names start at %0 and increment by one up to %9—even higher if you use the SHIFT batch file subcommand. When executing a batch file, the batch file name itself (which is itself a string, of course) is in position 0, and so it automatically becomes variable %0. The first string following the batch file name is %1, the second string is %2, and so on. From now on, each of these strings will be referred to as a parameter on the command line.

The most important reason for using replaceable parameters in your batch files is to make them more functional over a wide range of applications. Batch files become more useful if you can specify different parameters every time they are used. Look back at the batch file COMPRESD.BAT, which prints the file you specify on the command line in compressed mode on your printer. The first command in the file sets the printer to compressed mode and the last command returns it to normal mode.

You can use this batch file to print any file in compressed mode by specifying the file to be printed on the command line after the batch file name. If you don't specify a filename, nothing is sent to the printer because the %1 variable in the second line of the file is blank. You can use several techniques to ensure that the user of a batch file with replaceable parameters types in the strings neded by the file. The modified COMPRESD.BAT file shown below checks for the existence of parameter %1 before continuing with the rest of its commands. (Remember that the Alt-number combinations are entered by holding the Alt key down, typing the numbers on the numeric keypad, then releasing the Alt key.)

```
ECHO OFF
CLS
IF "%1" == "" GOTO NOSTRING
ECHO (Alt-15) > LPT1:
COPY %1 LPT1:
ECHO (Alt-155)@ > LPT1:
GOTO END
:NOSTRING
ECHO What file do you want to print?
:END
```

If parameter %1 is blank, the third line causes a branch to the :NOSTRING label, displays the message there, and then ends processing. If a filename was typed, the file is sent to the printer as normal, and the batch file jumps over the message to the :END label where the batch file ends. All of this is possible by using the batch file subcommand IF, which compares the strings inside the quotes. If you don't enter a string on the command line, nothing is inserted between the quotes for the %1 variable, which makes the IF statement true. The batch file then branches to the NOSTRING label. When the file is to be used by beginners, a more helpful approach would be to replace the terse message between :NOSTRING and :END with the following lines:

```
ECHO COMPRESSED PRINT BATCH FILE.
ECHO To use this batch file,
ECHO enter the batch file name
ECHO followed by the name of the
ECHO file you want to print.
ECHO For example, to print the file
ECHO file MYFILE.TXT
ECHO you would type COMPRESD MYFILE.TXT
:END
```

MAKING SELECTIONS WITH A BATCH FILE As you gain practice writing batch files and their commands, you'll find you can create batch files that let you select options within them. In the following example, the directory listing can be displayed in various formats, depending on the string you enter on the command line. If you type SORTBY NAME, the directory of the disk is sorted in alphabetical order by filename. Typing SORTBY DATE sorts the list by date. You can also sort by filename extension or by size. Typing SORTBY alone displays the help messages.

```
ECHO OFF
CLS
IF "%1" == "" GOTO HELP
GOTO %1
:HELP
ECHO To uee this program, type
ECHO the batch file name
ECHO followed by either NAME, EXT,
ECHO SIZE, or DATE
GOTO END
:NAME
DIR | SORT
GOTO END
:EXT
DIR | SORT /+10
GOTO END
:SIZE
DIR | SORT /+17
GOTO END
:DATE
DIR | SORT /+24
GOTO END
:END
```

Line 4 of the batch file causes a branch to the label specified, and the directory listing is then sorted in the appropriate way and displayed on the screen. You can send the listing to a printer or to a file by adding I/O redirection commands (> PRN or > TEMP) to the end of each DIR command.

ADVANCED UTILITIES The two enhanced utility files listed below incorporate many of the tips, tricks, and techniques you've learned so far. The first is called COLOR.BAT. It allows you to easily change the foreground color on a color graphics monitor. Before using COLOR .BAT for the first time, you must put the following line:

UTILITY PROGRAMS THAT SAVE TIME AND EFFORT

DOS MENUS DOS batch files can only do so much and require that the user know the intricacies of the system to efficiently manage directories, access complex applications, and so forth. To make things easier for both the novice and the busy power user, many software firms have developed DOS shells and hard disk management systems that simplify DOS operations while providing extended functions that are impossible to duplicate using DOS batch files alone. Some of these programs, many of which were reviewed recently in *PC Magazine*'s Short Report (Volume 4 Number 24 and Volume 4 Number 25), include *APX Core Executive, 1Dir Direct Command System, XTREE, PreCursor, PC Menu, KeepTrack, Multi-Program Coordinator, Direc-Tree, Startup!*, and *Menu Manager*.

PRINT UTILITIES The marketplace offers the busy PC user a wide range of software to set up a printer without resorting to batch files or other programming. Such programs—many of which have been reviewed as part of *PC Magazine*'s special printer issues (Volume 3 Number 23 and Volume 4 Number 19)—also offer a much broader range of control over a printer than is usually possible using DOS batch files. A brief list of these print configurator programs includes *Adapta-Print, Facelift, Printer Boss, Sideways, Select-A-Font, PrintStar, Softype, PrintMan, Fancy Font 2.2, Printworks, Set-FX*, and *NicePrint*.

LOGGING UTILITIES Many of the products included in the DOS Menus list include computer-use logging and password security functions as a matter of course. However, you can also get these functions in utilities produced by a number of companies. Recent IRS regulations requiring computer users to keep accurate logs of system use for tax purposes make these products valuable additions to your system software. These logging utilities include *Security, Syslog, PhasorCode, Log On*, and *Privacy-Plus*.—**David Obregón**

FACT FILE

PRINT UTILITIES

Adapta-Print
Comp-Sy Inc.
1900 N. Winston Rd.
Knoxville, TN 37919
(615) 693-0551
List Price: $65
Requires: 128K RAM, DOS 2.0 or later,
graphics printer.
CIRCLE **647** ON READER SERVICE CARD

Facelift
Companion Software Inc.
P.O. Box 480741
Los Angeles, CA 90048
(213) 462-2759
List Price: $29.95
Requires: 64K RAM, DOS 1.0 or later, BASIC or BASICA, dot matrix printer.
CIRCLE **646** ON READER SERVICE CARD

Printer Boss
Connecticut Software Systems
30 Wilson Ave,.
Rowayton, CT 06853
(203) 838-1844
List Price: $139.95
Requires: 128K RAM; Epson, Okidata, or Diablo printer.
CIRCLE **645** ON READER SERVICE CARD

Sideways
Funk Software Inc.
P.O. Box 1290
Cambridge, MA 02138
(617) 497-6339
List Price: $60
Requires: 64K RAM, DOS 1.0 or later,
dot matrix printer.
CIRCLE **644** ON READER SERVICE CARD

Select-A-Font
IBM Personally Developed Software
P.O. Box 3280
Wallingford, CT 06494
List Price: $19.95
Requires: 128K RAM. DOS 1.1 or later,
graphics printer.
CIRCLE **643** ON READER SERVICE CARD

Fontrix 2.5
Data Transforms Inc.
616 Washington St.
Denver, CO 80203
(303) 832-1501
List Price: $155
Requires: 256K RAM. DOS 2.0 or later,
dot matrix printer.
CIRCLE **642** ON READER SERVICE CARD

LePrint
LeBaugh Software Corp.
2720 Greene Ave.
Omaha, NE 68147
(800) 532-2844
(402) 733-7600
List Price: $149
Requires: 128K RAM, DOS 1.1 or later,
dot matrix printer
CIRCLE **641** ON READER SERVICE CARD

PrintStar
Memory Chips Inc.
927-A Lincoln Ave.
San Rafael, CA 94901
(415) 456-4211
List Price: $95
Requires: 128K RAM, Epson or Okidata printer.
CIRCLE **640** ON READER SERVICE CARD

Softtype
Photon Software
P.O. Box 1408
Bellevue, WA 98009
(713) 496-1179
List Price: $69
Requires: 128K RAM, DOS 1.0 or later,
dot matrix printer or plotter.
CIRCLE **639** ON READER SERVICE CARD

PrintMan
Qualitas
P.O. Box 3AK, UPB
Las Cruces, NM 88003
(505) 522-0290
List Price: $59
Requires: 192K RAM, dot matrix or daisy wheel printer.
CIRCLE **638** ON READER SERVICE CARD

Fancy Font 2.2
SoftCraft Inc.
P.O. Box 9802, #917
Austin, TX 78766
(512) 346-8380
List Price: $180
Requires: 128K RAM; DOS 1.1 or later; Epson, Toshiba, or Okidata (with Plug 'n Play) printer.
CIRCLE **637** ON READER SERVICE CARD

Printworks* and *Set-FX
SoftStyle Inc.
7192 Lalanianaole Hwy., #3205
Honolulu, HI 95825
(808) 396-6368
List Price: *Printworks*, $69.95; *Set-FX*, $59.95
Requires: 128K RAM, DOS 1.1 or later,
dot matrix printer.
CIRCLE **636** ON READER SERVICE CARD

■ PC LAB NOTES

```
DEVICE = ANSI.SYS
```

in your CONFIG.SYS file and reboot your system. (Other ways to change screen colors periodically appear in *PC Magazine* Productivity columns; see PC Tutor, Volume 4 Number 9, for one example.)

```
ECHO OFF
CLS
IF "%1" == "" GOTO HELP
GOTO %1
:HELP
ECHO This batch file allows you to change
ECHO colors on your monitor.  To change,
ECHO type COLOR, followed by the color
ECHO which may be RED, GREEN, BLUE, or RESET
GOTO END
:RED
PROMPT $e[31m
GOTO END
:GREEN
PROMPT $e[32m
GOTO END
:BLUE
PROMPT $e[34m
GOTO END
:RESET
PROMPT $e[0m
:END
PROMPT $p$g
```

You can include even more color selection if you wish. Lengthy batch files like COLOR.BAT work faster in RAM memory, so you may want to copy it over to your RAMdisk, if available.

The next batch file allows you to change and even to combine printer type styles on your Epson, IBM, or compatible printer. You can even make several selections at once. The batch file illustrates the use of the DOS SHIFT command to increment parameters if more than one printer style has been entered by the user. When entering the file, remember to follow the treatment of the (Alt-number) entries explained previously. Note that the condensed code may be entered simply by typing Alt-15 rather than by using the full SETTYPE.BAT.

```
ECHO OFF
CLS
IF "%1" == "" GOTO HELP
ECHO SETTING PRINTER TYPESTYLES
GOTO %1
:LOOP
SHIFT
IF "%1" == "" GOTO END
GOTO %1
:HELP
ECHO USE THE CODES BELOW AS PARAMETERS
ECHO FOR SETTYPE
ECHO-------------------------------
ECHO WIDE (sete enlsrged mode on)
ECHO COND (sets condensed mode on)
```

NicePrint
Spies Laboratories
P.O. Box 336
Lawndale, CA 90260
(213) 538-8166
List Price: $95
Requires: 27K RAM above normal system requirements; DOS 3.0 or later; IBM Graphics Printer, Epson FX printer with Graftrax, Gemini 10 & 15 series, or Okidata Microline printer with Plug 'n Play.
CIRCLE **635** ON READER SERVICE CARD

DOS MENU

APX Core Executive
Application Executive Corp.
600 Broadway
New York, NY 10012
(212) 226-6347
List Price: $95
Requires: 128K RAM, two disk drives,
DOS 2.0 or later.
CIRCLE **634** ON READER SERVICE CARD

1Dir Direct Command System
Bourbaki Inc.
P.O. Box 2867
Boise, ID 83702
(208) 342-5849
List Price: $95
Requires: 64K RAM, one disk drive,
DOS 2.0 or later.
CIRCLE **633** ON READER SERVICE CARD

XTREE
Executive Systems Inc.
15300 Ventura Blvd., #3305
Sherman Oaks, CA 91403
(818) 990-3457
List Price: $49.95
Requires: 192K RAM, hard disk, DOS 2.0 or later.
CIRCLE **632** ON READER SERVICE CARD

PreCursor
David L. Aldridge Co. Inc.
341 Town & Country Village
Houston, TX 77024
(800) 538-8157
(713) 464-7465
List Price: $69.95
Requires: 128K RAM, hard disk, DOS 2.0 or later.
CIRCLE **631** ON READER SERVICE CARD

PC Menu
Touch Technologies
609 S. Escondido Blvd., #101
Escondido, CA 92025
(619) 743-0494
List Price: $139.95
Requires: 256K RAM, hard disk, DOS 2.0 or later.
CIRCLE **630** ON READER SERVICE CARD

KeepTrack
The Finot Group
2390 El Camino Real, #3
Palo Alto, CA 94306
(415) 322-6161
List Price: $49.95
Requires: 192K RAM, hard disk, DOS 2.0 or later.
CIRCLE **629** ON READER SERVICE CARD

Multi-Program Coordinator
P.O. Box 1863
Cape Coral, FL 33910
List Price: $49.95
Requires: 128K RAM, hard disk, DOS 2.0 or later.
CIRCLE **628** ON READER SERVICE CARD

Direc-Tree
Micro-Z Co.
4 Santa Bella Rd.
Rolling Hills Estate, CA 90274
(213) 377-1640
List Price: $49.50
Requires: 128K RAM, hard disk, DOS 2.0 or later.
CIRCLE **627** ON READER SERVICE CARD

Startup!
Vertical Solutions Inc.
P.O. Box 5051
Evanston, IL 60204
(800) 821-1926
(312) 328-3961
List Price: $50
Requires: 64K RAM, hard disk, DOS 2.0 or later.
CIRCLE **626** ON READER SERVICE CARD

Menu Manager
Phoenix Systems Inc.
1106 Ohio River Blvd.
Sewickley, PA 15143
(412) 323-5654
List Price: $100
Requires: 128K RAM, hard disk, DOS 2.0 or later.
CIRCLE **625** ON READER SERVICE CARD

LOGGING UTILITIES

Security
ANSWER in COMPUTERS
6035 University Ave., #37
San Diego, CA 92115
(619) 287-0795
List Price: $50
Requires: 64K RAM, one disk drive,
DOS 1.1 or later.
CIRCLE **624** ON READER SERVICE CARD

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```
ECHO ULINE (eete underline mode on)
ECHO EMPH (aete emphasized mode on)
ECHO BOLD (eete double etrike on)
ECHO RESET (reaete printer to normal)
GOTO ENO
:WIOE
ECHO (Alt-155)W1 > LPT1
GOTO LOOP
:CONO
ECHO (Alt-15) > LPT1
GOTO LOOP
:ULINE
ECHO (Alt-155)-1 > LPT1
GOTO LOOP
:EMPH
ECHO (Alt-155)E > LPT1
GOTO LOOP
:BOLO
ECHO (Alt-155)G > LPT1
GOTO LOOP
:RESET
ECHO (Alt-155)@ >LPT1
:ENO
```

SETTYPE.BAT has several interesting features you may find useful in other batch files. Several parameters can be specified on the command line at one time. For example, if you type SETTYPE WIDE BOLD, the batch file would first read WIDE in as parameter %1, branch to :WIDE, and set enlarged mode on your printer. After setting the style, a branch is made back to :LOOP, and the parameters on the command line are shifted over one. BOLD is then read as parameter %1, and the same sequence occurs. The printer is set, and a branch is made back to :LOOP as before. The third time through, however, the IF command detects a blank parameter and causes execution to branch to the end of the batch file.

PASSWORD SYSTEMS Many office PCs have several users who share the same programs and some of the same data files. While elaborate precautions may have to be taken to protect really confidential files, simple password systems will suffice for many office needs (see the accompanying sidebar for commercial software packages that offer more sophisticated protection schemes). The first routine shown below is the simplest. It involves the use of an AUTOEXEC.BAT file and of a special password batch file called LOGON.BAT. The AUTOEXEC.BAT file listed below simply clears the screen and displays a message.

```
ECHO OFF
CLS
ECHO Type LOGON, a space,
ECHO then your password
```

In answer to the screen message displayed, if your password were JOE, you would simply type LOGON JOE. This then executes the LOGON.BAT batch file shown below.

```
ECHO OFF
CLS
IF "%1" == "" GOTO TRYAGAIN
IF "%1" == "JOHN" GOTO OK
IF "%1" == "JOE" GOTO OK
ECHO ACCESS OENIEO
GOTO ENO
:TRYAGAIN
ECHO PASSWORD?  TRY AGAIN
GOTO ENO
:OK
TYPE MENU.TXT
:ENO
```

LOGON.BAT compares the password entered on the command line with the preset passwords shown on lines 4 and 5. If there is an exact match (which requires that you enter the name in uppercase letters) with either line, a jump is made to line 12 and a system menu (such as you created earlier) is displayed. If an incorrect password is entered, the "Access denied" message is displayed and the batch file terminates. This batch file, although not foolproof, will deter most users from getting into the files on the disk. An experienced user, however, will know that he can bypass the whole system by simply pressing Ctrl-Break as the system boots. This stops the execution of the batch file and displays the DOS prompt. Later, this same batch file will be used, not so much for password protection, but to ensure that each user logs into his own directories.

A more sophisticated password routine is shown below. This time the PROMPT command is used to blank the screen while the password is being typed. In order to use PROMPT in this way, you must include the statement.

```
DEVICE = ANSI.SYS
```

in your CONFIG.SYS file. The user is then requested to enter a password. In this new version, the user password is actually the name of a batch file that resets the screen to normal mode, sets the system parameters, and displays a menu. The PROMPT command in the AUTOEXEC.BAT file uses the extended keyboard and screen controls available when you load the ANSI.SYS keyboard driver at boot time, as described in the previous paragraph. The control code to clear the screen is ESC[8m, which can be obtained by typing PROMPT $e[8m; the PROMPT metastring $e produces the escape code. This command effectively blanks out the screen, deterring unauthorized entries. Characters can still be typed, but they will be invisible. The AUTOEXEC.BAT file consists of

```
ECHO OFF
CLS
ECHO ENTER PASSWORD
PROMPT $e[8m
```

The next file to create is the actual password batch file. When entered, the name of the batch file itself first restores the screen to normal mode and then continues with the normal booting procedure, eventually displaying your system menu. I called the file GROCK.BAT, but you could substitute any password you want.

```
PROMPT $e[0m
ECHO OFF
CLS
PATH \;\DOS
PROMPT $P$G
TYPE MENU.TXT
```

Any user who does not know the name of the password file will be left looking at a blank screen. If you want to tighten security even further, you can hide the password batch file in a subdirectory. For example, if the password file were stored in the subdirectory \MYFILES, you would have to know to type \MYFILES\GROCK to log on to the system.

There are many ways to create password systems, including the use of BASIC programs. For example, you could write a short program that inhibits Ctrl-Break, asks the user for a password, and fills the screen with garbage or locks it up if an incorrect password is entered. Keep in mind, however, that experienced users will usually be able to break through just about any software password scheme.

The next example uses a password system, not so much to keep unauthorized users out but to ensure that each user on a multiple user system is placed in his respective directories and has access to only his files. The batch file used is identical to the LOGON.BAT file described earlier, except that it adds the following line after the :END label of LOGON.BAT.

```
SET USER = %1
```

The new last line of the batch file con-

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■ PC LAB NOTES

tains the SET command. It sets the systemwide variable USER equal to the password specified on the command line. This variable is available for use by any other batch file to make its commands specific to the current user. For example, if you type LOGON JOE, the variable USER would then hold the string JOE.

To make use of this variable in any other batch file, you surround it with the percent sign, as in %USER%. For example, assume that you have *Microsoft Word* stored in a subdirectory called WORD and available to any user. Branching from the WORD subdirectory are several other subdirectories, one for each set of user files. Now assume that the first selection on your main menu is used by each user to get into the WORD program. By using the variable %USER% in the 1.BAT menu file, you can ensure that each user is placed into the WORD subdirectory where his files are stored. The contents of 1.BAT file are shown below.

```
ECHO OFF
CLS
CD \WORD\%USER%
PATH \WORD
WORD
CD \
PATH \;\DOS
TYPE MENU.TXT
```

The first five lines of this batch file are used to get into the WORD program; the last three lines redisplay the system's main menu when the user exits WORD. Assuming Joe logged on to the system, the third line becomes CD\WORD\JOE and transfers Joe to his subdirectory. The fourth line sets the system path so that WORD can be executed from a subdirectory.

SENDING AND RECEIVING MAIL If several users share the same computer, the following routines will allow them to send and receive messages among themselves. Each user has a specific file that acts like a mailbox, holding messages from other users. When one user wants to send a message to another user—who will presumably log on at a later time—the SENDMAIL.BAT file is used. When a user wants to read his messages, the READMAIL.BAT file is used. The routines again use the systemwide variable %USER% and the passwords of each user to read and write mail. Each user's password actually becomes the name of his mail file. The READMAIL.BAT consists of the following:

```
ECHO OFF
CLS
MORE < \%USER%.MAL
```

Now, when Joe logs on to the system and types READMAIL, the variable %USER% is set to JOE and the batch file displays the file JOE.MAL.

SENDMAIL.BAT, below, can be used to write mail to any other user, assuming you know his password.

```
ECHO OFF
CLS
IF "%1" == "" GOTO NONAME
ECHO MAIL TO %1
ECHO BE SURE TO TYPE YOUR NAME AND THE DATE
EDLIN TEMP.MAL
COPY %1.MAL+TEMP.MAL %1.MAL
ERASE TEMP.MAL
ECHO %1'S MAIL FILE APPENDED
GOTO END
:NONAME
ECHO YOU DIDN'T ENTER A NAME, START OVER
:END
```

When Joe wishes to send mail to JOHN, he simply types SENDMAIL JOHN and any existing mail file for John will be appended to the new text sent by Joe. Later, when John logs on, he simply types READMAIL to view his mail file. In this case, the EDLIN editor is used to append messages to the mail file, but you could use any word processor. Generally, EDLIN loads fast and provides a quick way into and out of editing mode. As you can see, the whole appending process is automated by the batch file; the user need only know a few simple EDLIN commands such as List, Insert, and End edit. ■

Tom Sheldon, a writer living in Santa Barbara, California, has written a book on tips, tricks, and techniques for the PC entitled Introducing PC DOS: A Guide for Beginning and Advanced Users, *due from McGraw-Hill in May 1986.*

IN THE NEXT PC LAB NOTES A short course on protecting your files from accidental deletion and one of the most valuable of all PC tools—recovering accidentally erased files—using simple DOS techniques. PC Lab Notes will explain how to do it yourself and refer you to products that can do it for you.

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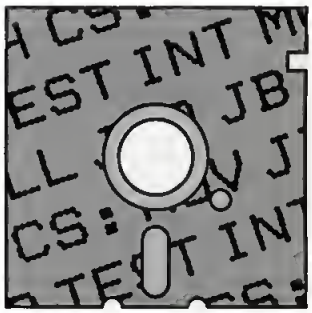

BROWSE.COM lets you do what the DOS TYPE command doesn't: move forward and backward within a displayed file, line by line or screen by screen.

The DOS file-handling commands are well known. Most of us would be lost without old friends like COPY, RENAME, DEL, and COMP. But what if you want to look at the contents of a file? The DOS TYPE command lets you display a file only line by line, from beginning to end, in simple teletype fashion.

For short files, TYPE's limitations are no problem. But if you want to look at something in the middle or at the bottom of a large file, with TYPE you can only sit and wait for it to come up. And if you accidentally miss something, you can't go back to a previous part of the file. You must TYPE from the top all over again.

Of course, you could always read the file into your word processor to look at it—assuming that your word processor supports the direct import of ASCII files. That's a nuisance, however, and even a speed horse like *XyWrite II Plus* takes some time before it displays the file on your screen.

I've written BROWSE for the times you want to look around in a file but don't want to bother with your editor or word processor. You can use it as a full-screen TYPE command. BROWSE writes directly to the display, so it's fast, and it uses the cursor keys to navigate within the file, line by line, screen by screen, backward and forward, left and right.

BROWSE is easy to use. Just enter

```
BROWSE filename
```

Since BROWSE requires DOS 2.0 or later, you can use a drive and path specification before the filename.

For *WordStar* users tired of seeing Greek when TYPEing document files to the screen, I've added a *WordStar* mode. This simply strips out the high bit of all characters, so you can read the words instead of guessing at them. To use BROWSE in *WordStar* mode, enter

```
BROWSE filename /W
```

The W can be either uppercase or lowercase.

When you invoke BROWSE, it saves the current screen contents and displays the first 25 lines of the beginning of the file. To see the next 25 lines, press PgDn. To go backward 25 lines, press PgUp. To go ahead or back one line at a time, use the Cursor up and Cursor down keys.

The Home key brings you back to the top of the file. The End key displays the last line of the file on the screen. (With very long files, getting to the end may take a little time, because BROWSE scans for line feeds while reading the file in 16K chunks.)

■ I've written BROWSE for the times you want to look around in a file but don't want to bother with your editor or word processor.

For lines longer than 80 columns, BROWSE does not wrap the rest of the line on the display (as TYPE does) but truncates the line at the right of the display instead. If you want to see the rest of the line, you scroll the display horizontally by pressing the Cursor right key. Each time you press the Cursor right key the display window moves eight characters to the right. The Cursor left key brings the display window back to normal.

BROWSE expands Tab characters (ASCII 9) to the next eight-character boundary. It ignores Carriage Returns (ASCII 13) and breaks lines at Line Feed characters (ASCII 10). BROWSE does no other processing of characters; everything else is displayed directly on the screen. With ASCII files, you may see some small right arrows at the end of the file. These are End of File indicators (ASCII 26 or Ctrl-Z). The TYPE command stops when it hits the first End of File. BROWSE does not.

As with TYPE, non-ASCII files (such as those with .COM, .EXE, .OBJ, *1-2-3* .WKS files, or binary .BAS file extensions) will generally display as garbage. However, since BROWSE displays the whole file instead of stopping at the first Ctrl-Z, you can use it to take a look at .COM or .EXE files to find possible error messages, copyright notices, or even undocumented commands.

To get out of BROWSE, simply press the Esc key or Ctrl-Break. Your previous screen will be restored, and you'll be back at the DOS command level.

■ PROGRAMMING/UTILITIES

BROWSE has four error messages. The first, "Requires DOS 2.0 or above," will appear if you try to run the program under DOS 1.1. BROWSE requires about 33K of memory to run. If it doesn't find that much, you'll be greeted with the second error message: "Not enough memory." BROWSE will print the message "File not found" if it can't find the file. Finally, BROWSE writes directly to the screen, so it will print the message "Unsupported video mode" if the screen happens to be in a graphics mode. (Few people use DOS in a graphics mode.)

BROWSE is EGA-aware. If you have an EGA and use its 43-line mode while in DOS, BROWSE will work with 43 lines. (It will not set the screen to 43 lines, however.) When BROWSE is writing to an EGA, it will also skip the vertical retrace checks that are required with the Color Graphics Adapter to prevent colorful screen snow. (You'll still get a little snow with the Color Graphics Adapter, for BROWSE checks only for vertical retraces when writing the file to the screen. It does not do a retrace check when clearing the screen before writing to it.)

BROWSE has been tested on an IBM PC with an IBM Monochrome Adapter, an IBM Color Graphics Adapter, and an IBM Enhanced Graphics Adapter. However, it may or may not run properly on your "compatible."

When running BROWSE under *TopView* or *Windows*, specify "writes directly to screen" in the PIF. The 52K memory requirement default is fine. For the *TopView* PIF, specify that BROWSE intercepts Interrupt 23h.

GETTING BROWSE You can get BROWSE for yourself in several ways. The first (and best) is to use your modem to call *PC Magazine*'s Interactive Reader Service at (212) 696-0360. (Use 300 or 1200 baud, eight data bits, no parity, and one stop bit.) The PC-IRS has been recently upgraded and improved: If you've been frustrated before trying to get through, you may want to try again. As with all bulletin boards, the best times are those when the rest of the world is asleep, but I've also had success in the late evening and early morning hours. Contrary to widespread belief, getting through to the IRS is not impossible and is much easier now that more incoming lines have been added.

If your communications software supports the Xmodem protocol, you can download BROWSE.COM directly and be ready to go. Familiarizing yourself with your modem's Xmodem procedures before you get on the IRS will help. You can also read some information about Xmodem on the PC-IRS if all this is new to you.

If your communications software does not support Xmodem but you own either the IBM or Microsoft Macro Assembler, you can download BROWSE.ASM and execute the commands:

```
MASM BROWSE;
LINK BROWSE;
EXE2BIN BROWSE BROWSE.COM
```

As usual when creating a .COM program, ignore the "No stack segment" message from LINK.

If you don't have a macro assembler, you can download BROWSE.ASC, rename it to BROWSE.BAS, read it into BASICA, and run it. This will create BROWSE.COM directly.

If you don't have a modem, you can type in the BROWSE.ASM file shown in Figure 1. Don't worry about uppercase and lowercase. My use of case in assembly language is a personal idiosyncrasy that you don't have to share. Use the macro assembler to assemble and link it as described above.

And if you don't have a modem or a macro assembler, we still have a way for

```
;       BROWSE.ASM -- Full Screen File Pager
;       ------------------------------------

CSEG            Segment
                Assume  CS:CSEG, DS:CSEG, ES:CSEG, SS:CSEG
                Org     0080h
Parmeter        Label   Byte
                Org     0100h
Entry:          Jmp Begin

;       All Data
;       --------

                db      'ATTR='
Attribute       db      0               ; Current screen attribute
                db      'SHIFT='
ShiftSerie      db      0               ; Horizontal shift screen default
DosVersionFail  db      'Requires DOS 2.0 or above$'
NoSpaceFail     db      'Not enough memory$'
FileFail        db      'File Not Found$'
ScreenFail      db      'Unsupported video mode$'
Delimiters      db      0,' ,;=/'       ; Delimiters in parameter
FileHandle      dw      ?               ; Use for saving file handle
VSMode          db      0FFh            ; AND value for non-WordStar mode
LineLength      db      ?               ; Length of line (from BIOS)
NumberLines     db      25,0            ; Number of lines (check EGA BIOS)
ScreenSize      dw      ?               ; Size of screen in bytes
CheckRetrace    db      1               ; Flag zero if EGA or MONO used
Addr6845        dw      ?               ; Could use for retrace check
ScreenAddr      Label   DWord           ; Address of screen
ScreenOff       dw      0               ; Higher for non-page 0
ScreenSeg       dw      0B800h          ; Set to 0B000h for Mono Mode 7
ScreenStart     dw      ?               ; Points within buffer
EndOfFile       dw      ?               ; Points within buffer
FileOffset      dw      -1, -1          ; Address within file of buffer data
HorizOffset     dw      0               ; Horizontal offset for display
RightMargin     dw      0               ; Right margin for offset display
Dispatch        dw      Home, Up, PgUp, Dummy, Left
                dw      Dummy, Right, Dummy, End, Down, PgDn

;       Check DOS Version for 2.0 or above
;       ----------------------------------

Begin:          Cld                     ; All string directions forward
                Mov     AH,30h
                Int     21h             ; Get DOS Version Number
                Cmp     AL,2            ; Check for 2.0 or later
                Jae     DOSVerOK
                Mov     DX,Offset DOSVersionFail
                Mov     AH,9            ; Write error message
                Int     21h
                Int     20h

;       Parse Command Line to get File Spec and WordStar flag
;       -----------------------------------------------------

DOSVerOK:       Mov     SI,1 + Offset Parameter ; Points to parameter
NameSearch:     Lodsb                   ; Get byte
                Cmp     AL,13           ; Check if carriage return
                Je      NoFileFound     ; If no, no file name
                Mov     DI,Offset Delimiters    ; String of delimiters
                Mov     CX,5            ; Number of delimiters (no /)
                Repne   Scasb           ; See if a match
                Je      NameSearch      ; If a delimiter, keep looking
                Mov     DX,SI           ; Otherwise found file name
                Dec     DX              ; Points to beginning of it
EndSearch:      Lodsb                   ; Get next byte
                Cmp     AL,13           ; See if carriage return
                Je      GotFileEnd      ; If no, we're all done
                Mov     DI,Offset Delimiters    ; String of delimiters
                Mov     CX,6            ; Number (including /)
                Repne   Scasb           ; See if a match
                Jne     EndSearch       ; If not, still in file name
                Mov     Byte Ptr [SI - 1],0     ; If no, mark end of file name
                Jcxz    GotFlag         ; If eleven, check for W
                Jmp     EndSearch       ; Or continue flag search
GotFlag:        Lodsb                   ; Get byte after / flag
                Or      AL,20h          ; Uncapitalize
                Cmp     AL,'w'          ; See if w for WordStar mode
                Jne     GotFileEnd      ; If not, just ignore it
                Mov     [VSMode],7Fh    ; AND value for WordStar

;       Open the File
;       -------------

GotFileEnd:     Mov     Byte Ptr [SI - 1],0     ; Mark end of file name
                                        ; DX still points to name
                Mov     AX,3D00h        ; Open file for reading
                Int     21h             ;   by calling DOS
                Jnc     GotTheFile      ; If no error, continue
NoFileFound:    Mov     DX,Offset FileFail      ; Otherwise print a message
                Jmp     ErrorExit
GotTheFile:     Mov     [FileHandle],AX         ; Save the file handle
```

(Figure 1 continues)

Figure 1: *The assembly language code for BROWSE.COM. You can also download it from PC-IRS.*

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■ PROGRAMMING/UTILITIES

```
;       Get Screen Mode Information from BIOS Data Area
;       -----------------------------------------------

                Push    ES                      ; Save register
                Sub     AX,AX
                Mov     ES,AX                   ; Set ES to 0 (BIOS Data)
                Mov     AL,ES:[0449h]           ; Current Video Mode
                Cmp     AL,3                    ; Check if Color Alpha
                Jbe     DisplayOK               ; Continue if so
                Cmp     AL,7                    ; Check if monochrome display
                Je      Monochrome              ; If so, branch
                Mov     DX,Offset ScreenFail    ; We can't handle graphics
                Jmp     ErrorExit               ; Go print an error message
Monochrome:     Mov     [ScrecnSeg],0B000h      ; Use Monochrome Segment
                Mov     [CheckRetrace],0        ; Don't have to check retrace
DisplayOK:      Mov     AL,ES:[044Ah]           ; Number of Columns
                Mov     [LineLength],AL         ; Save it
                Mov     AX,ES:[044Eh]           ; Offset into screen buffer
                Mov     [ScreenOff],AX          ; Save it
                Mov     AX,ES:[0463h]           ; Address of 6845 Register
                Mov     [Addr6845],AX           ; Save it
                Push    ES
                Sub     DL,DL                   ; Set Rows to zero first
                Sub     BH,BH
                Mov     AX,1130h                ; EGA BIOS: Get Information
                Int     10h
                Pop     ES
                Or      DL,DL                   ; Check if DL is still zero
                Jz      NoEGA                   ; If so, skip rest of stuff
                Inc     DL
                Mov     [NumberLines],DL        ; Save Number of Lines
                Test    Byte Ptr ES:[0487h],4   ; Check if must check retrace
                Jne     NoEGA
                Mov     [CheckRetrace],0        ; EGA says we don't have to
NoEGA:          Mov     BH,ES:[0462h]           ; Get Current Page (use later)
                Pop     ES
                Mov     AL,[LineLength]         ; Length of each line
                Mul     [NumberLines]           ; Total chars on screen
                Add     AX,AX                   ; Double for attributes
                Mov     [Screen6ize],AX         ; And Save it

;       See if enough memory in left
;       ----------------------------

                Add     AX,Offset ScreenBold    ; Add ScreenSize to code end
                Add     AX,256                  ; Add a little stack room
                Cmp     AX,SP                   ; Check against stack pointer
                Jbe     GetEnufMemory           ; Continue if OK
                Mov     DX,Offset NoSpaceFail   ; Otherwise end program
                Jmp     ErrorExit               ;    with error message

;       Get Current Screen Attribute
;       ----------------------------

GotEnufMemory:  Cmp     [Attribute],0           ; Check if attribute pre-set
                Jnz     GotAttribute            ; If so, move on
                Mov     DL,' '                  ; Write out a byte
                Mov     AX,2                    ;    using DOS
                Int     21h
                Mov     AL,8                    ; Now backspace
                Mov     AX,14                   ;    using BIOS call
                Int     10h
                Mov     AH,0                    ; Need character & attribute
                Int     10h                     ;    using BIOS call (BH = pg)
                Mov     [Attribute],AX          ; And save attribute

;       Save Current Screen
;       -------------------

GotAttribute:   Mov     DX,Offset Terminate     ; Set Ctrl-Break exit
                Mov     AX,2523h                ;    to terminate that way
                Int     21h
                Mov     DI,Offset ScreenHold    ; Destination of screen
                Mov     CX,[ScreenSize]         ; Size of screen
                Push    DS                      ; Save Source Segment
                Lds     SI,[ScreenAddr]         ; Get screen address
                Rep     Movsw                   ; Move in the bytes
                Pop     DS                      ; Restore Source Segment

;       Get Keyboard Key and Decide on Action
;       -------------------------------------

                Call    Home                    ; Need file in
                Mov     [ScreenStart],SI        ; Set buffer address
KeyLoop:        Call    UpDateScreen            ; Write file to screen
GetKey:         Mov     AX,0                    ; Get key
                Int     21h                     ;    by calling DOS
                Cmp     AL,27                   ; Check if ESC
                Je      Terminate               ; If so, terminate
                Cmp     AL,0                    ; Check if extended
                Jnz     GetKey                  ; If not, try again
                Mov     AX,0                    ; Get extended code
                Int     21h                     ;    by calling DOS
                Sub     AL,71                   ; Subtract Home key value
                Jb      GetKey                  ; If below that, not valid
                Cmp     AL,(81 - 71)            ; Check if above PgDn
                Je      GetKey                  ; If so, ignore it
                Sub     AH,AH                   ; Zero out top byte
                Add     AX,AX                   ; Double for word access
                Mov     BX,AX                   ; Offset is dispatch table
                Mov     SI,[ScreenStart]        ; Set current buffer pointer
                Call    [Dispatch + BX]         ; Do the call
                Mov     [ScreenStart],SI        ; Set new buffer pointer
                Jmp     KeyLoop                 ; And update the screen

;       Terminate -- Restore screen and close file
;       ------------------------------------------

Terminate:      Mov     SI,Offset ScreenHold    ; Address of Saved Screen
                Les     DI,[ScreenAddr]         ; Address of Display
                Mov     CX,[ScreenSize]         ; Number of characters
                Rep     Movsb                   ; Move them back
                Mov     BX,[FileHandle]         ; Get File Handle
                Mov     AH,3Eh                  ; Close File
                Int     21h
                Int     20h                     ; Terminate
```

(Figure 1 continues)

```
;       Cursor Key Routines -- Home Key
;       -------------------------------

Home:           Sub     BX,BX                   ; For zeroing out values
                Mov     AX,[FileOffset]         ; Check if read in file
                Or      AX,[FileOffset + 2]
                Mov     [FileOffset],AX         ; Zero out file address
                Mov     [FileOffset + 2],BX
                Mov     [HorizOffset],BX        ; Zero out horizontal offset
                Mov     BX,Offset Buffer        ; Reset buffer pointer
                Jz      Dummy                   ; Skip file read if in already
                Mov     DX,Offset Buffer        ; Area to read file in
                Mov     CX,32768                ; Number of bytes to read
                Call    FileRead                ; Read in file
Dummy:          Ret

;       Up and PgUp Keys
;       ----------------

Up:             Call    GetPrevChar             ; Get previous char in buffer
                Jc      UpDone                  ; If none available, finish
UpLoop:         Call    GetPrevChar             ; Get previous char again
                Jc      UpDone                  ; If none, we're done
                Cmp     AL,10                   ; Check if line feed
                Jnz     UpLoop                  ; If not, try again
                Call    GetNextChar             ; Get char after line feed
UpDone:         Ret

PgUp:           Mov     CX,Word Ptr [NumberLines]       ; Number of lines
PgUpLoop:       Call    Up                      ; Do UP that many times
                Loop    PgUpLoop
                Ret

;       Left and Right Keys
;       -------------------

Left:           Mov     [HorizOffset],0         ; Reset Horizontal Offset
                Ret

Right:          Mov     AL,[ShiftHoriz]         ; Get places to shift
                Sub     AX,AX
                Add     [HorizOffset],AX        ; Move that many right
                Ret

;       End, Down, and PgDn Keys
;       ------------------------

End:            Mov     BX,SI                   ; Save buffer pointer
                Call    PgDn                    ; Go page down
                Cmp     BX,SI                   ; Check if we did so
                Jnz     End                     ; If so, do it again
                Ret

Down:           Call    GetNextChar             ; Get next character
                Jc      NoMoreDown              ; If no more, we're done
DownLoop:       Call    GetNextChar             ; Get one again
                Jc      UpLoop                  ; If no more, find prev LF
                Cmp     AL,10                   ; See if line feed
                Jnz     DownLoop                ; If not, continue
NoMoreDown:     Ret

PgDn:           Mov     CX,Word Ptr [NumberLines]       ; Number of lines
PgDnLoop:       Call    Down                    ; Do DOWN that many times
                Loop    PgDnLoop
                Ret

;       Update Screen
;       -------------

UpdateScreen:   Push    ES
                Mov     SI,[ScreenStart]        ; Address of data in buffer
                Les     DI,[ScreenAddr]         ; Address of display
                Mov     CX,ScrSenSize           ; Number of bytes in screen
                Shr     CX,1                    ; Half for number of chars
                Mov     AL,' '                  ; Fill blank screen
                Mov     AX,[Attribute]          ; With screen attribute
                Rep     Stosw                   ; Bleek it
                Mov     AL,[LineLength]         ; Length of display line
                Sub     AX,AX
                Add     AX,[HorizOffset]        ; Add Horizontal Offset
                Mov     [RightMargin],AX        ; That's right display margin
                Sub     DL,DL                   ; Line Number
LineLoop:       Sub     BX,BX                   ; Column Number
                Mov     AL,[LineLength]         ; Use Line Length
                Mul     DL                      ;    and Line Number
                Add     AX,AX                   ;       to recalculate
                Mov     DI,AX                   ;       display destination
                Add     DI,[ScreenOff]          ; Add beginning address
CharLoop:       Call    GetNextChar             ; Get next character
                Jc      EndOfScreen             ; If no more, we're done
                And     AL,[WSMode]             ; Will be 7Fh for WordStar
                Cmp     AL,13                   ; Check for carriage return
                Jc      CherLoop                ; Do nothing if so
                Cmp     AL,10                   ; Check for line feed
                Je      LineFeed                ; Do routine if so
                Cmp     AL,9                    ; Check for tab
                Je      Tab                     ; Do routine if so
                Mov     CX,1                    ; Just 1 char to display
PrintChar:      Cmp     BX,[HorizOffset]        ; See if we can print it
                Jb      NoPrint
                Cmp     BX,[RightMargin]        ; See if within margin
                Jae     NoPrint
                Mov     AX,[Attribute]          ; Attribute for display
                Cmp     [CheckRetrace],0        ; See if must stop anew
                Jz      WriteIt                 ; If not, skip retrace wait
                Push    BX
                Push    DX
                Mov     BX,AX                   ; Save character and attribute
                Mov     DX,[Addr6845]           ; Set up I/O address
                Add     DX,6
RetraceWait1:   In      AL,DX                   ; Check until
                Shr     AL,1                    ;    vertical retrace
                Jc      RetraceWait1            ;    ends
                Cli                             ; Clear interrupts
RetraceWait2:   In      AL,DX                   ; Check until
                Shr     AL,1                    ;    vertical retrace
```

(Figure 1 continues)

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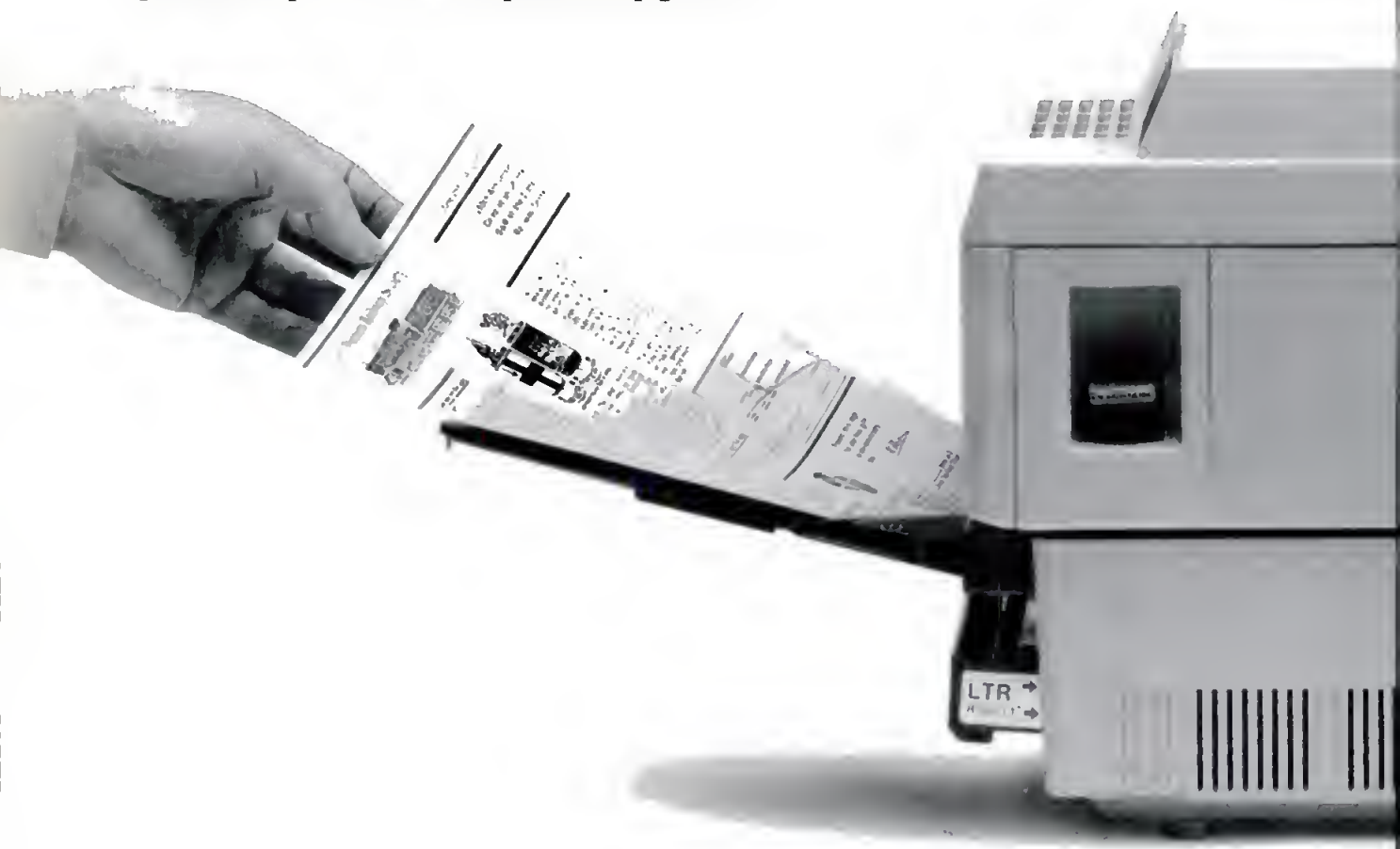

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■ PROGRAMMING/UTILITIES

```
                Jnc     RetraceWait2            ;       begins
                Mov     AX,BX                   ; Get back character & attr
                Stosw                           ; Write to display
                Sti                             ; Enable interrupts again
                Pop     DX
                Pop     BX
                Jmp     Short NoPrint           ; Skip around "no snow" write
WriteIt:        Stosw                           ; Write without retrace wait
NoPrint:        Inc     BX                      ; Bump up line counter
                Loop    PrintChar               ; Do it CX times
                Jmp     CharLoop                ; Then go back to top
Tab:            Mov     AX,BX                   ; Current column number
                And     AX,87h                  ; Take lower three bits
                Mov     CX,8
                Sub     CX,AX                   ; Subtract from 8
                Mov     AL,' '                  ; Will print CX blanks
                Jmp     PrintChar
LineFeed:       Inc     DL                      ; Next line
                Cmp     DL,[NumberLines]        ; See if down at bottom
                Jb      LineLoop                ; If not, continue
EndOfScreen:    Pop     ES                      ; All done -- leave
                Ret

;       Get Next Character from buffer
;       ------------------------------
;               (Input is BX pointing to buffer, Returns AL, CY if no more)

GetNextChar:    Cmp     BX,[EndOfFile]          ; See if at end of file
                Jae     NoMoreNext              ; If so, no more there
                Cmp     SI,Offset BufferEnd     ; See if at end of buffer
                Jb      CanGetNext              ; If not, just get character
                Push    CX                      ; Otherwise save registers
                Push    DX
                Push    DI
                Push    ES
                Push    DS                      ; Set ES to DS
                Pop     ES                      ;   (could be different)
                Mov     BX,Offset BufferMid     ; Move 2nd buffer half
                Mov     DI,Offset Buffer        ;   to 1st buffer half
                Mov     CX,16384
                Sub     [ScreenStart],CX        ; New buffer pointer
                Rep     Movsb                   ; Move them
                Mov     SI,DI                   ; SI also buffer pointer
                Add     [FileOffset],32768      ; Adjust file addr to read
                Adc     [FileOffset + 2],0
                Mov     DX,Offset BufferMid     ; Place to read file
                Mov     CX,16384                ; Number of bytes
                Call    FileRead                ; Read the file
                Sub     [FileOffset],16384      ; Now adjust so reflects
                Sbb     [FileOffset + 2],0      ;   1st half of buffer
                Pop     ES                      ; Get back registers
                Pop     DI
                Pop     DS
                Pop     CX
                Jmp     GetNextChar             ; And try again to get char
CanGetNext:     Lodsb                           ; Get the character
NoMoreNext:     Cmc                             ; So CY set if no more
                Ret

;       Get Previous Character from buffer
;       ----------------------------------

GetPrevChar:    Cmp     BX,Offset Buffer        ; See if at top of buffer
```

(Figure 1 continues)

```
                Ja      CanGetPrev              ; If not, just get character
                Mov     AX,[FileOffset]         ; See if at top of file
                Or      AX,[FileOffset + 2]
                Jz      AtTopAlready            ; If so, can't get anymore
                Push    CX                      ; Save some registers
                Push    DX
                Mov     BX,Offset Buffer        ; Move 1st half of Buffer
                Mov     DI,Offset BufferMid     ;   to 2nd half of buffer
                Mov     CX,16384
                Add     [ScreenStart],CX        ; New buffer pointer
                Rep     Movsb                   ; Do the move
                Sub     [FileOffset],16384      ; Adjust file addr for read
                Sbb     [FileOffset + 2],0
                Mov     DX,Offset Buffer        ; Area to read file into
                Mov     CX,16384                ; Number of bytes
                Call    FileRead                ; Read the file
                Pop     DX                      ; Get back registers
                Pop     CX
                Jmp     Short CanGetPrev        ; Now get character
AtTopAlready:   Stc                             ; CY flag set for no more
                Ret
CanGetPrev:     Dec     SI                      ; Move pointer back
                Mov     AL,[BX]                 ; Get the character
                Clc                             ; CY flag reset for success
                Ret

;       Read CX bytes from the file into DX buffer
;       ------------------------------------------

FileRead:       Push    AX                      ; Save some registers
                Push    BX
                Push    CX
                Push    DX
                Mov     [EndOfFile],-1          ; Initialize this
                Mov     DX,[FileOffset]         ; Get file address to read
                Mov     CX,[FileOffset + 2]
                Mov     BX,[FileHandle]         ; Get file handle
                Sub     AL,AL                   ; Do LSEEK from beginning
                Mov     AH,42h                  ; LSEEK call
                Int     21h
                Pop     DX                      ; Get back destination
                Pop     CX                      ; Get back count
                Mov     AH,3Fh                  ; Read file function call
                Int     21h
                Jnc     NoReadError             ; If no error, continue
                Sub     AX,AX                   ; Otherwise read zero bytes
NoReadError:    Cmp     AX,CX                   ; See if 32K has been read
                Je      GotItAll                ; If so, we're home free
                Add     AX,DX                   ; Otherwise add to buffer addr
                Mov     [EndOfFile],AX          ; And save as end of file
GotItAll:       Pop     BX
                Pop     AX
                Ret

;       File Buffer and Screen Hold Areas
;       ---------------------------------

Buffer          Label   Byte                    ; Area for file reads
BufferMid       equ     Buffer + 16384          ; Halfway through it
BufferEnd       equ     BufferMid + 16384       ; At end of it
ScrSaveHold     equ     BufferEnd               ; Area for holding screen
CSEG            Ends                            ; End of segment
                End     Entry                   ; Denotes entry point
```

(Figure 1 ends)

you to get BROWSE. Take a deep breath, relax, and type the BROWSE.BAS program shown in Figure 2 into your BASICA interpreter. If you use the same line numbers, the program will inform you of any typing errors in the DATA statements. If you get an "out of data" error message, it probably means you've skipped a line. A "COM file is not valid" message without a previous line number error probably means one line was typed in twice.

PROGRAMMING COMPROMISES

Programs are rarely born in final form, and along the way there are compromises and tough decisions. For people who ask "Why did you do it this way instead of that way," it may be instructive to look at some of the problems I had to deal with when writing BROWSE.

ASCII was the first problem. In a normal ASCII file each line is terminated with two characters, a Carriage Return (ASCII 13), to bring the cursor back to the beginning of the same line, and a Line Feed

```
100 REM -- BASIC PROGRAM TO CREATE BROWSE.COM
110 OPEN "BROWSE.COM" AS #1 LEN = 1
120 FIELD #1,1 AS A$
130 CHECKSUM = 0
140 FOR I% = 1 TO  128
150     LINESUM% = 8
160     FOR J% = 1 TO 8
170         READ BYTE%
180         CHECKSUM = CHECKSUM + BYTE%
190         LINESUM% = LINESUM% + BYTE%
200         IF (BYTE% < 256) THEN LSET A$ = CHR$(BYTE%)
210         PUT #1
220     NEXT J%
230     READ LINECHECK%
240     IF LINECHECK% <> LINESUM% THEN PRINT "Error in Line";280 + 10 * I%
250 NEXT I%
260 CLOSE
270 IF CHECKSUM = 92718 THEN PRINT "Successful Completion!" : END
280 PRINT "COM file is not valid!" : END
290 DATA     233,    150,      0,     65,     84,     84,     82,     61,    759
300 DATA       0,     83,     72,     73,     70,     84,     61,      8,    451
310 DATA      82,    101,    113,    117,    185,    114,    101,    115,    848
320 DATA      32,     68,     79,     83,     32,     50,     46,     48,    438
330 DATA      32,    111,    114,     32,     97,     98,    111,    118,    713
340 DATA     181,     36,     70,    111,    116,     32,    101,    110,    685
350 DATA     111,    117,    183,    184,     32,    189,    101,    109,    786
360 DATA     111,    114,    121,     36,     70,    185,    108,    181,    766
370 DATA      32,     78,    111,    116,     32,     70,    111,    117,    667
380 DATA     110,    180,     36,     85,    110,    115,    117,    112,    785
390 DATA     112,    111,    114,    116,    101,    188,     32,    118,    804
400 DATA     185,    180,    181,    111,     32,    189,    111,    108,    769
410 DATA     101,     36,      9,     32,     44,     59,     61,     47,    389
420 DATA       0,      0,    255,      0,     25,      0,      0,      0,    280
```

(Figure 2 continues)

Figure 2: *This BASIC program will create BROWSE.COM.*

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13) **Improved integration with other modules including Payroll.**
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15) Flexible chart of accounts.
16) Prints financial statem… defined formats.
17- Prints Income S…
22) Balance Sheet … quarter, and 3 p…
23- Prints *Departme…*
28) Statement and Bal… month, current quarte… quarters.
29- Prints *Budget Comparison*
30) Income Statement and Balance Sheet comparing Actual vs. Budget with variances and ratios.
31- Prints Trial Balance and Chart
32) of Accounts
33) Prior Period Adjusting Entries do not impact current results.
34) Data Entry screen displays beginning, current and ending balances as well as the last 10 entries.
35) System allows new accounts to be created during data entry.

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36) **Vendors may be added to system during the entry of invoices.**
37) **Simplified selection of vendors and invoices for payment.**
38) Provides for entry, updating and deletion of vendor information.
39- Allows entry, editing and posting
40) of payables, adjustments, cancellations and prepaids.
41- Prints the Open Item & Cash
42) Requirements reports.
43) Allows partial payments
44) Prints A/P checks
45) Prints Check register.
46) Prints the A/P distributions to the General Ledger
47) Prints the vendor anaylsts report
48) Interfaces to MCBS' General Ledger or may stand alone.

Accounts Receivable

49) **Customize your own headings on Invoices and Credit Memos. No programming required.**
50) **Add finance charges at the rate you choose to accounts you wish to charge.**

Accounts Receivable cont.

51) Provides for entry, updating and deletion of customer infomation
52) Allows entry, editing and posting of receivables, credit memos, cash payments.
53) Allows up to 99 repetitive line items for fast invoicing.
54) Prints the open item and aged receivables reports.
55- Prints Invoices, Credit Memos
57) and Statements
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59) Supports Partial Payments
60) Prints Invoice, Payment and Credit Memo Registers.
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62) **Now *Integrates* with General Ledger.**
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71) Calculates the payroll.
72) Prints the payroll register, check register and deductions register.
73) Prints payroll checks
74) Provides for after-the-fact payroll
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87) Provides for order entry and editing with inventory update during entry.
88) Stock and non-stock items.
89) Handles purchases, returns, shipments and adjustments.
90) Prints invoices, credit memos, picking tickets, purchase orders, price lists and shipping labels.**
91) Prints on preprinted forms or plain paper.
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95) Performs book to physical analysis.
96- Over 20 management reports
116) including extensive Sales Analysis and Lost
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5.25" DSDD-HD	$3.45 ea	$3.14 ea
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```
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440 DATA      0,      0,      0,    255,    255,    255,    255,      0,   1020
450 DATA      0,      0,      0,    239,      2,     19,      3,     37,    380
460 DATA      3,     18,      3,     47,      3,     18,      3,     54,    149
470 DATA      3,     18,      3,     64,      3,     74,      3,     89,    257
480 DATA      3,    252,    180,     48,    205,     33,     60,      2,    783
490 DATA    115,      9,    186,     16,      1,    180,      9,    205,    721
500 DATA     33,    205,     32,    190,    129,      0,    172,     60,    821
510 DATA     13,    116,     59,    191,     90,      1,    185,      5,    668
520 DATA      0,    242,    174,    116,    241,    139,    214,     74,   1200
530 DATA    172,     60,     13,    116,     30,    191,     98,      1,    681
540 DATA    185,      6,      0,    242,    174,    117,    241,    198,   1163
550 DATA     68,    255,      0,    227,      2,    235,    233,    172,   1192
560 DATA     12,     32,     60,    119,    117,      5,    198,      6,    549
570 DATA    106,      1,    127,    198,     68,    255,      0,    184,    939
580 DATA      0,     61,    205,     33,    115,      5,    186,     60,    665
590 DATA      1,    235,    178,    163,    104,      1,      6,     43,    731
600 DATA    192,    142,    192,     38,    160,     73,      4,     60,    861
610 DATA      3,    118,     20,     60,      7,    116,      5,    186,    515
620 DATA     75,      1,    235,    153,    199,      6,    117,      1,    787
630 DATA      0,    176,    198,      6,    112,      1,      0,     38,    531
640 DATA    160,     74,      4,    162,    107,      1,     38,    161,    707
650 DATA     78,      4,    163,    115,      1,     38,    161,     99,    659
660 DATA      4,    163,    113,      1,      6,     42,    210,     42,    581
670 DATA    255,    184,     48,     17,    205,     16,      7,     10,    742
680 DATA    210,    116,     19,    254,    194,    136,     22,    108,   1059
690 DATA      1,     38,    246,      6,    135,      4,      4,    117,    551
700 DATA      5,    198,      6,    112,      1,      0,     38,    138,    490
710 DATA     62,     98,      4,      7,    160,    107,      1,    246,    685
720 DATA     38,    108,      1,      3,    192,    163,    110,      1,    616
730 DATA      5,    190,    132,      5,      0,      1,     59,    196,    588
740 DATA    118,      6,    186,     42,      1,    233,     53,    255,    894
750 DATA    128,     62,      8,      1,      0,    117,     20,    178,    514
760 DATA     32,    180,      2,    205,     33,    176,      8,    188,    816
770 DATA     14,    205,     16,    180,      8,    205,     16,    136,    780
780 DATA     38,      8,      1,    186,    216,      2,    184,     35,    678
790 DATA     37,    205,     33,    191,    190,    132,    139,     14,    941
880 DATA    110,      1,     30,    197,     54,    115,      1,    243,    751
810 DATA    164,     31,    232,     74,      0,    137,     54,    119,    811
820 DATA      1,    232,    183,      0,    180,      8,    205,     33,    842
830 DATA     60,     27,    116,     36,     60,      0,    117,    244,    660
840 DATA    180,      8,    205,     33,     44,     71,    114,    236,    891
850 DATA     60,     10,    119,    232,     42,    228,      3,    192,    886
860 DATA    139,    216,    139,     54,    119,      1,    255,    151,   1074
870 DATA    131,      1,    137,     54,    119,      1,    235,    209,    887
880 DATA    190,    190,    132,    196,     62,    115,      1,    139,   1025
890 DATA     14,    110,      1,    243,    164,    139,     30,    104,    805
900 DATA      1,    180,     62,    205,     33,    205,     32,     43,    761
910 DATA    219,    161,    123,      1,     11,      6,    125,      1,    647
920 DATA    137,     30,    123,      1,    137,     30,    125,      1,    584
930 DATA    137,     30,    127,      1,    190,    190,      4,    116,    795
940 DATA      9,    186,    190,      4,    185,      0,    128,    232,    934
950 DATA    122,      1,    195,    232,     55,      1,    114,     12,    732
960 DATA    232,     50,      1,    114,      7,     60,     10,    117,    591
970 DATA    247,    232,    222,      8,    195,    139,     14,    108,   1157
980 DATA      1,    232,    231,    255,    226,    251,    195,    199,   1590
990 DATA      6,    127,      1,      0,      0,    195,    160,     15,    504
1000 DATA     1,     42,    228,      1,      6,    127,      1,    195,    601
1010 DATA   139,    222,    232,     20,      0,     59,    222,    117,   1011
1020 DATA   247,    195,    232,    181,      0,    114,      9,    232,   1210
1030 DATA   176,      0,    114,    196,     60,     10,    117,    247,    920
1040 DATA   195,    139,     14,    188,      1,    232,    234,    255,   1178
1050 DATA   226,    251,    195,      6,    139,     54,    119,      1,    991
1060 DATA   196,     62,    115,      1,    139,     14,    110,      1,    638
1070 DATA   209,    233,    176,     32,    138,     38,      8,      1,    835
1080 DATA   243,    171,    160,    107,      1,     42,    228,      3,    955
1090 DATA     6,    127,      1,    163,    129,      1,     42,    210,    679
1100 DATA    43,    219,    160,    107,      1,    246,    226,      3,   1005
1110 DATA   192,    139,    248,      3,     62,    115,      1,    232,    992
1120 DATA   104,      0,    114,    100,     34,      6,    106,      1,    465
1130 DATA    60,     13,    116,    243,     60,     18,    116,     80,    698
1140 DATA    60,      9,    116,     62,    185,      1,      0,     59,    492
1150 DATA    30,    127,      1,    114,     48,     59,     30,    129,    538
1160 DATA     1,    115,     42,    138,     38,      8,      1,    128,    471
1170 DATA    62,    112,      1,      0,    116,     38,     83,     82,    486
1180 DATA   139,    216,    139,     22,    113,      1,    131,    194,    955
1190 DATA     6,    236,    208,    232,    114,    251,    250,    236,   1533
1200 DATA   208,    232,    115,    251,    139,    195,    171,    251,   1562
1210 DATA    90,     91,    235,      1,    171,     67,    226,    199,   1080
1220 DATA   235,    173,    139,    195,     37,      7,      0,    185,    971
1230 DATA     8,      0,     43,    200,    176,     32,    235,    183,    877
```

(Figure 2 continues)

(ASCII 10), which moves the cursor to the next line. But what if BROWSE encounters a file with lines terminated by just carriage returns? Should it simply let one line print over the previous line, as TYPE does? What about a file whose lines are terminated with only line feeds? Should it drop down one line without going to the beginning of the line? What about backspaces? Should BROWSE actually backspace and write over whatever character happened to be there?

I decided to interpret line feeds by themselves as "new line" codes, to ignore carriage returns entirely, and to "print" backspaces as characters rather than to backspace. This avoided all possibilities of overprinting characters or lines.

Another problem was memory. BROWSE has to read the file into memory before it can display it. The simplest approach would have been to limit BROWSE to files less than 64K in length. It could then read in the whole file at once. But I wanted BROWSE to work with files larger than 64K. If I limited BROWSE to files no bigger than available memory, I could still load the whole file in and not bother with the file again, but that also was too limiting, besides adding complications that arise from skipping over segment boundaries.

I finally decided to have BROWSE read in the file 16K bytes at a time. BROWSE reads additional blocks when it needs them. Although this approach definitely made the program more complex, the result is that BROWSE can handle files of any length.

Then there's the problem of line-wrapping versus horizontal scrolling for lines longer than 80 characters. Wrapping the lines (like TYPE does) worked great in BROWSE's first form because that early version couldn't page backward through the file. Once I added backward paging to the program, I saw that wrapping would be unworkable because of the difficulty in finding the start of the previous screen. It turned out, however, that horizontal scrolling is not difficult at all to implement, even though it seems more sophisticated than wrapping.

Most ASCII files you'll be looking at have lines less than 80 characters long, so you won't be horizontally scrolling at all.

■ PROGRAMMING/UTILITIES

```
1240 DATA   254,   194,    58,    22,   108,     1,   114,   136,   887
1250 DATA     7,   195,    59,    54,   121,     1,   115,    67,   619
1260 DATA   129,   254,   190,   132,   114,    60,    81,    82,  1042
1270 DATA    87,     6,    30,     7,   190,   190,    68,   191,   769
1280 DATA   190,     4,   185,     0,    64,    41,    14,   119,   617
1290 DATA     1,   243,   164,   139,   247,   129,     6,   123,  1052
1300 DATA     1,     0,   128,   131,    22,   125,     1,     0,   408
1310 DATA   186,   190,    60,   185,     0,    64,   232,    83,  1008
1320 DATA     0,   129,    46,   123,     1,     0,    64,   131,   494
1330 DATA    30,   125,     1,     0,     7,    95,    90,    89,   437
1340 DATA   235,   184,   172,   245,   195,   129,   254,   190,  1604
1350 DATA     4,   119,    52,   161,   123,     1,    11,     6,   477
1360 DATA   125,     1,   116,    41,    81,    82,   190,   190,   826
1370 DATA     4,   191,   190,    60,   185,     0,    64,     1,   703
1380 DATA    14,   119,     1,   243,   164,   129,    46,   123,   839
1390 DATA     1,     0,    64,   131,    30,   125,     1,     0,   352
1400 DATA   186,   190,     4,   185,     0,    64,   232,    11,   872
1410 DATA     0,    90,    89,   235,     2,   249,   195,    78,   938
1420 DATA   138,     4,   246,   195,    80,    83,    81,    82,   911
1430 DATA   199,     6,   121,     1,   255,   255,   139,    22,   998
1440 DATA   123,     1,   139,    14,   125,     1,   139,    30,   572
1450 DATA   104,     1,    42,   192,   180,    66,   205,    33,   823
1460 DATA    90,    89,   180,    63,   205,    33,   115,     2,   777
1470 DATA    43,   192,    59,   193,   116,     5,     3,   194,   805
1480 DATA   163,   121,     1,    91,    88,   195,     0,     0,   659
```

(Figure 2 ends)

For looking at spreadsheets printed to files, horizontal scrolling is preferable to wrapping. However, files created by word processors that use a one-line-per-paragraph format (such as *Microsoft Word* and *XyWrite II Plus*) will require a lot of horizontal scrolling to read lines in their entirety.

INNER WORKINGS BROWSE begins by checking the DOS version. If it's 2.0 or later, it reads through the command line at offset 80h in the Program Segment Prefix to get the filename and possible *WordStar* flag. BROWSE then uses the BIOS data area to get information about the display, including the current video mode, the number of characters per line, and whether an Enhanced Graphics Adapter (EGA) is present. If the EGA is there, BROWSE gets the number of lines from the EGA BIOS instead of simply using 25. BROWSE also attempts to get your current screen color, so it doesn't have to display white on black. It saves the current display screen in a buffer and displays the first part of the file on the screen.

From this point on, BROWSE sits in a loop waiting for keystrokes. Whenever it detects a cursor key, it executes a small routine and then refreshes the screen. At an Esc key, it restores the original display saved when it began and exits.

The cursor key routines and the screen display routine (called UpdateScreen) both use a common pointer to the file buffer area and two subroutines called GetNextChar and GetPrevChar, which get the next or previous character from the buffer. The GetNextChar and GetPrevChar routines are responsible for determining when BROWSE needs to read in another piece of the file. If so, these two routines can call the FileRead subroutine. They return the carry flag set if the pointer is at the beginning or end of the file. This organization allows the cursor key and screen display routines to be divorced from the problems of file handling, since they merely see the file as one long string of characters.

■ I've included two patch points at the beginning of BROWSE to use for customizing it.

The file buffer area is split in two pieces. To understand the reason for this, suppose you BROWSE a 64K file. BROWSE first reads in the first 32K of the file. You use the Cursor down key to scan through the file line by line. When you're near the end of the 32K, BROWSE will need more of the file. However, if it reads in another 32K over the first 32K, the UpdateScreen routine would have to read in the first 32K again at the beginning of the screen display and the second 32K before it got down to the bottom. This involves an intolerable number of disk accesses whenever a screen crosses a buffer boundary. Splitting the buffer in half and reading in only 16K at a time cuts down the file accesses greatly.

PATCHING BROWSE I've included two patch points at the beginning of BROWSE you can use for customizing.

The first is for the screen color or attribute. BROWSE attempts to get your current screen color (however you may have set it) to use when displaying the file on the screen. If you'd rather use a unique color for BROWSE, you can read BROWSE into DEBUG and set the byte after the text ATTR= to a specific color. The byte will be at address 108h, so the DEBUG command is

```
E 108 attr
```

where "attr" is a hexadecimal background/foreground color combination. These are listed in the PC *Technical Reference* manual.

When shifting right, BROWSE uses a default of 8 characters. You may want to increase this to 40 or even 80, or you can decrease it to 1. That byte is at offset 10Fh following the text SHIFT=. You must enter it in hexadecimal, such as

```
E 10F 28
```

to set the horizontal shift amount to 40 characters, for instance.

You can get some practice in assembly language by enhancing BROWSE. One possible addition is a display on the top of the screen showing the current byte offset in the file, or the line number, or both. This information is not readily available in BROWSE, but you can add a few more variables to keep track of it.

Another helpful addition would be a search command to search for character strings. Of course, once you get a string search working, you may be tempted to convert the program into a full-screen ASCII editor instead of just a browser.

I'm not sure I'm brave enough to begin that job. It's really not what I want to do with BROWSE. All I want is a way to look at files without the limitations of TYPE. ■

Charles Petzold is a contributing editor of PC Magazine.

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Sierra On-Line, *Dragon's Keep, Troll's Tale*
Simon & Schuster, *Typing Tutor III*
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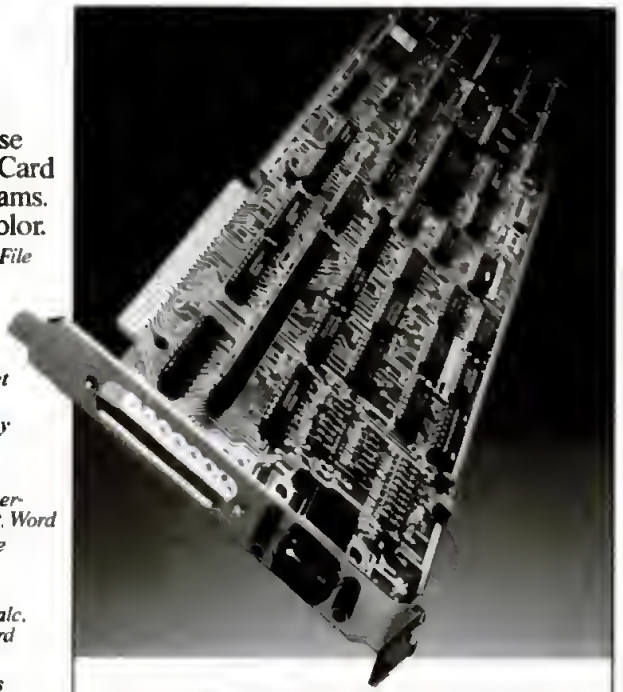

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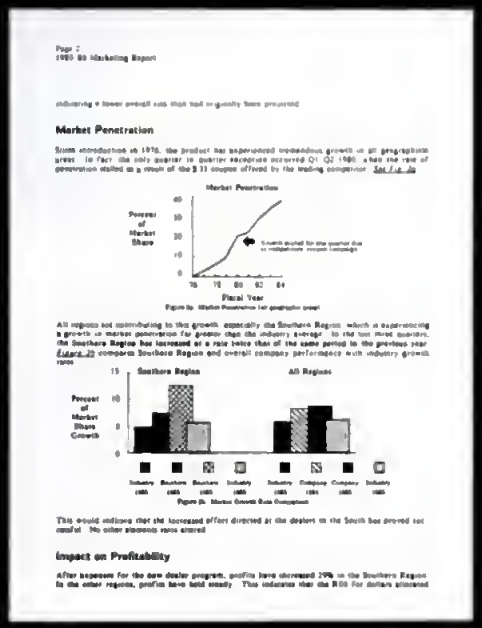

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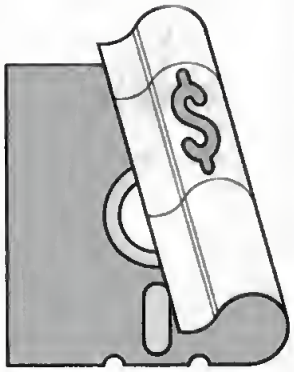
■ EDITED BY JARED TAYLOR



SPREADSHEET CLINIC

This forum lets readers exchange the ingenious solutions and timesaving hints that make their spreadsheets and integrated software packages work better.

RUNNING A 1-2-3 TICKLER FILE

A *1-2-3* database can be a satisfactory tickler file. I enter all my important dates and deadlines with the date function, along with a few words of description. However, I ran into a problem when I tried to extract today's appointments with /Data Query.

In the simple database in Figure 1, the input range is C1..E9, the criterion range is H1..H2, and the output range is C13..E16. I thought that if I put the @today function in the criterion range in cell H2, I would get today's appointments. No such luck. Somehow, every date in the database meets that criterion and is extracted to the output range.

Apparently /Data Query can't make sense of an unealculated date function, but it *does* work with plain date serial numbers. The simple solution is to enter today's date in cell H2 using the @date function, and then use Edit (F2) and Calc (F9) to turn it into a serial number.

A more complex solution is to use the macro contained in Figure 1. Its first line uses the /Data Fill command to enter today's serial number in cell H2, which has the range name DATE. If DATE has no special format, you will get a plain number. In Figure 1, DATE is date-formatted, so the number looks like a date. The second line of the macro executes the /Data Query. I have named this macro \0 so that it autoexecutes and gives me today's appointments every time I load it. Figure 1 shows how the file would look if I loaded it on March 17, 1986.

Kendall Callas
San Francisco, California

This is a simple solution to a quirk in 1-2-3*'s /Data Query command. Sharp-eyed readers will also approve of the clever use of /Data Fill in the first line of the macro.*

	C	D	E	F	G	H
1	Date		Action			Date
2	08-Jul-86		Give Speech		DATE	17-Mar-86
3	30-Mar-86		Elections			
4	17-Mar-86		Annual Report			
5	14-Nov-85		Payments Due			
6	29-Mar-86		Awards Dinner			
7	18-May-86		Closing			
8	07-Feb-86		5-year Plan			
9	13-Sep-86		London			
10						
11					\0	/dfDATE~@today~~~
12						{query}
13	Date		Action			
14	17-Mar-86		Annual Report			
15						
16						

Figure 1: *A tickler file with macro to extract today's appointments.*

COUNTING THE WIDTH OF A PRINT RANGE

I often find that by the time I am ready to print a spreadsheet, I don't know how wide it is. This means I can't set my print margins and don't know if the spreadsheet will even fit on the paper. If all the column widths were the same, I could count the columns and multiply by the column width, but most spreadsheets have columns of varying widths.

The following macro will help you add up the widths of each column in a *1-2-3* spreadsheet:

```
\C   /wcs{?}~{?} {right}/xg\C~
```

To use the macro, go to the bottom of your spreadsheet, where you have blank rows. Put the cursor just below the last data cell in the left-most column you want to print, and run the macro. It will first tell you the width of that column; hit Enter to leave it unchanged. Then type the number of the column width you saw displayed and hit Enter again. The column width will now be in the cell at which the cursor started, the cursor will have moved one cell to the right and the control panel will display the next column's width. Keep going with Enter, Number, Enter, until you get to the right edge of your spreadsheet, and hit Ctrl-Break to quit.

You now have a row of numbers representing the width of each column to be printed. If you @sum the numbers in this row, you'll get the width of your spreadsheet. As an added refinement, write a formula, such as 132-@sum(ROW), if your printing page is 132 characters wide. A

■ SPREADSHEET CLINIC

positive number means you have room for margins and a negative number means you must trim the spreadsheet before you can print it out.

Noelle Hermelee Rips
Omaha, Nebraska

MORE CHARACTER COUNTING

There are two ways to measure the width of a spreadsheet that work in *Symphony* but not in *1-2-3*. One is to switch to DOC mode and check the DOC Char counter after you fix the right margin. A better way is to put a ruler label in a blank row at the leftmost column of your print range. The label might look something like this:

```
12345678901234567890123456
```

An easy way to enter it is with the formula @repeat ("1234567890",15), which will give you a label that is 150 characters long. If you want a less cluttered ruler, you can enter

```
"1         "
```

as the @repeat string and get a 1 marker every ten characters.

If the cells to the right are blank, all the characters in the ruler will be visible, and you can use it to measure the width of your print range. If you scroll to the right, you can still see the characters in your ruler, even though the cell they are in is off the screen.

This method won't work with *1-2-3* because when the cell containing the ruler is off the screen to the left, its contents no longer spill over into the cells to its right.

Paul Goldberg
Waltham, Massachusetts

This works fine, but I would rather have a ruler like

```
1         2         3         4
```

This gives you the tens digit every ten characters, rather than a series of 1s.

COPYING OR MOVING IN LARGE WORKSHEETS

When you work with large spreadsheets, it can be a chore to copy or move data from one distant part to another. Rather than tabbing and paging repeatedly through the model, just break your spreadsheet into vertical or horizontal windows with the "copy from" area in one window and the "copy to" area in the other. This way you can see the coordinates of the origin and destination cells and use them in a command, or you can switch between windows and "point."

Stanley Strauss
Schenectady, New York

This should work with any spreadsheet that lets you split the screen.

PRINTING HEADERS IN 1-2-3

I was frustrated by *1-2-3*'s /Header printing option because it lets you print only one header line. I solved the problem by using

```
/Print/Printer/Options/Borders/Rows
```

and indicating the range that I want to appear as a header. Now I can print as many header lines as I like.

Kwadwo Boahene
Yonkers, New York

A good, simple solution. And you can use @today or any other trick to automatically update the cells you use as headers.

CONTROLLING AUTOEXEC MACROS

The \0, or autoexecuting macro, in *1-2-3* is a very handy feature, unless you don't *always* want the macro to run when you load a model. One way to control autoexec macros is to build a date test into them, so that they run only when you need them. The first line in the macro in Figure 2, for example, keeps the macro from running unless it is Friday. This would be a good way to start an autoexec macro that you would use to consolidate weekly figures or to print them out.

The second line in the macro is optional. It's there in case you want to call up the model on Friday and, for some reason, *don't* want the macro to run. The number that it tests today's date against is the number for Jan. 1, 1980, or the default date for DOS. If you don't want the macro to run, just don't give the system the date when you boot up. The macro will think it's Jan. 1, 1980, and quit.

Sam Reyburn
Bronx, New York

You can modify this technique so that the macro runs every other day, every 5th day, every 11th day, etc., but I can't think of an easy way to make it run only at the end of every month.

EDITING SPREADSHEETS WITH A WORD PROCESSOR

In your columns of June 25 (Volume 4 Number 13) and July 9 (Volume 4 Number 14), you presented several elaborate ways to control printers from any cell within a *1-2-3* worksheet. The same effect can be achieved more easily by using a word processor to prepare a spreadsheet for printing. Any word processor and spreadsheet program that handles compatible files will work.

■ To control autoexec macros, build in a date test, so they run only when you need them.

With *1-2-3*, all you have to do is save your worksheet to disk in printout format with the /Print File command. Just be sure that you have set the print margins (with /PFOMR and /PFOML) wide enough to contain the entire worksheet. Otherwise, the worksheet will print out in several pages, and you'll run into trouble.

Once your worksheet is on disk in a .PRN file, you can read it into any word processor that handles ASCII files. Now you can center and justify text, pick exotic fonts, and even run a spelling checker. You may be surprised how presentable your spreadsheet printouts can be, once

```
\0      /xi@mod(@today,7)<>6~/xq
        /xi@today=29221~/xq
          . . . Regular Autoexec Macro
                Continues Here . . .
```

Figure 2: *Autoexec macro that runs only when you want it to.*

■ SPREADSHEET CLINIC

you've gone over them with a powerful word processor.

Tan Lay Sar
Singapore

SORT AND DELETE

You can use *Symphony*, *1-2-3*, and other spreadsheets to do specialized editing not only of worksheets but of many kinds of documents. For example, when I download files from bulletin boards, I often want to remove certain lines such as report headers and footers, blank lines, and various lines of communications junk that may be in the file.

The tedious way to do it is to edit the file line by line. An easier way is to import the file into your spreadsheet and use the alphabetical sort command to rearrange the lines. That way, all the offending lines—as long as they're identical—will be bunched together, and you can delete them en masse. The problem, then, is how to get the remaining lines back into the right order again.

■ The tedious way to remove lines is to edit a file line by line. An easier way is to use the alphabetic sort command.

A good solution is first to insert a new column A to the left of the material you want to sort, then fill it with a number sequence. In *Symphony* or *1-2-3*, you can use the /Data Fill command. (With other spreadsheets, you can get a quick sequence by entering the number 1 in cell A1 and the formula A1+1 in cell A2. Then replicate the formula down the column as far as you need to go.) Now sort your rows with the text as the sort key. Delete the rows you don't want. Sort the rows again, this time with column A as the sort key. The remaining rows will return to their original order. Finally, to clean up the file, delete column A.

Raymond Hall
Winnipeg, Canada

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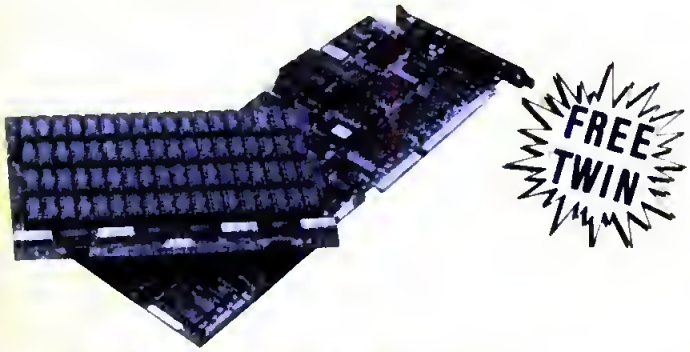

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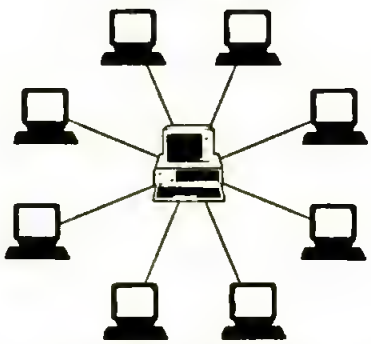

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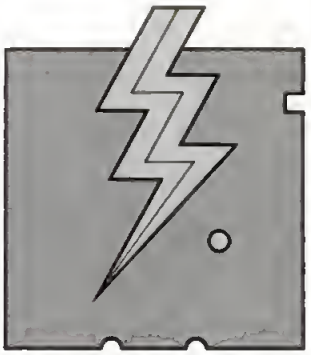

POWER USER

Push your hardware and applications software to the limit by incorporating these productivity-enhancing tips from readers.

HARD DISK PARK 'N LOCK

Almost every supplier recommends that hard disk heads be parked before moving the drive, whether the machine is shifted from one desk to another or shipped across the country. Some manufacturers supply software programs to do this for their drives; others do not. If you don't have such a program, you're living on borrowed time: it doesn't take much of a jar to wipe out data and permanently damage the disk surface.

By using DEBUG and entering the underlined portions of Figure 1, you can create your own program to move your hard disk's heads to the last (inmost) cylinder, which is reserved by the IBM BIOS for parking and testing.

```
A>DEBUG
-A
xxxx:0100  MOV  AX,800
xxxx:0103  MOV  DX,80
xxxx:0106  INT  13
xxxx:0108  MOV  DX,80
xxxx:010B  XCHG CH,CL
xxxx:010D  INC  CX
xxxx:010E  XCHG CH,CL
xxxx:0110  MOV  AX,C01
xxxx:0113  INT  13
xxxx:0115  MOV  AX,800
xxxx:0118  MOV  DX,81
xxxx:011B  INT  13
xxxx:011D  MOV  DX,81
xxxx:0120  XCHG CH,CL
xxxx:0122  INC  CX
xxxx:0123  XCHG CH,CL
xxxx:0125  MOV  AX,C01
xxxx:0128  INT  13
xxxx:012A  JMP  12A
xxxx:012C  <Return>
-RCX
CX 0000
:30
-NA:PARK
-W
Writing 0030 bytes
-Q

A>REN PARK PARK.COM
```

Figure 1: *You can create PARK.COM with DEBUG to protect your hard disks from accidentally being damaged during transit.*

PARK.COM uses a Hard Disk BIOS call to determine the size of the drive. It then adds one to the cylinder to get the number of the reserved cylinder. Having determined where to park the head, it then issues a different BIOS call to move the head to the parking cylinder. The process is repeated for a second drive; if either drive is not present, the BIOS calls have no effect. To make sure that the heads don't accidentally get unparked, the last instruction in the program is a jump to itself. This locks up the computer, requiring it to be turned off or reset via Ctrl-Alt-Del. The program is only 48 bytes in length (it takes up one cluster, however) and will work on the IBM PC, XT, and AT computers as well as most compatibles.

Mitchell Burko
Liverpool, New York

Hard disk users with True Blue equipment already have the requisite software head-parking program in the form of IBM's SHIPDISK.COM. If you simply pull that program off the Diagnostics Disk for everyday use, however, you'll find that after *parking the heads with SHIPDISK, your computer may (will) do many odd things before you turn it off. (SHIPDISK makes a final call to the Diagnostics Disk's operating system that DOS can't handle.) So, Mr. Burko's is a small, handy program to have on hand for routine use, though the usual caveat must be entered that somewhere out there someone undoubtedly makes a disk/PC-"compatible" combination that is incompatible with PARK .COM.*—Craig L. Stark

PCMAGNDX PROGRAM UPDATE

John L. Diehl's PCMAGNDX.PRG *dBASE* program, listed in *PC Magazine*'s Power User column (Volume 4 Number 23), is a great convenience in creating a database of the magazine's articles. There is one problem with the program, however. It works fine the first time through, but when a second set of index files is added, the Author and Category sections of the database are not appended correctly.

This is the result of relating the partial TEMPB.DBF file to the main PCMAGNDX.DBF file on a record-for-record basis, starting at the top of each data file. When the second set of files is added, PCMAGNDX.DBF contains more records than TEMPB.DBF (which is re-created each session). Thus, the Author and Category fields at the beginning of PCMAGNDX.DBF are written over with the new TEMPB.DBF data, while the last records are left blank.

I solved the problem (Figure 2) by changing one section of the program. When it's time to add Author and Category records to PCMAGNDX.DBF, the data file is searched for the first occurrence of blank records for those fields. Then the Author and Category data from TEMPB.DBF is transferred to PCMAGNDX.DBF, record by record, starting from this new location in the main file.

John J. Brown
Boise, Idaho

■ POWER USER

```
* PCMAGNDX.PRG--Converte PC Megezine Index Filee to dBASE Filee.
* J.L.  Diebl, Springfield, VA
*
* For dBASE III, aubetitute text within bracketa on right for line of program.
*
* Modifiad 10/24/85 by John J. Brown, Boiee, ID
* Modificatione to original program are ehown et tbe end of thie lieting.
                                    *[ SET HEADING OFF ]
                                    *[ SET SAFETY OFF ]
ERASE                               *[ CLEAR ]
SET TALK OFF
ACCEPT "Entar Voluma Numbar (tha First # in VOL$A$.TXT) " TO V
ACCEPT "Enter Issue Code (the Second # in VOL$A$.TXT) " TO N
ERASE                               *[ CLEAR ]
@ 12,25 SAY "Procesaing - Fleese Weit"
SELECT PRIMARY                      *[ SELECT A ]
USE pcmagndx
BELECT SECONDARY                    *[ SELECT B ]
USE tempa
APPEND FROM VOL&V.A&N..TXT SDF
GO TOF
@ 13,25 SAY "CREATING RECORD: "
DO WHILE .NOT.  EOF                 *[ EOF() ]
 STORE $(title,2,32) to Mtitle      *[ STORE SUBSTR(title,2,32) TO Mtitle]
 STORE $(aubject,2,35) to Meubject *[ STORE SUBSTR(eubject,2,35) TO Msubject]
 STORE vol TO Mvol
 STORE no TO Mno
 STORE page TO Mpege
 SKIP
 DO WHILE .NOT. EOF .AND. vol="  " *[ EOF() ]
  STORE TRIM(Mtitle)+title TO Mtitle
  STORE TRIM(Meubject)+aubject TO Msubject
  SKIP
 ENDDO
 SELECT PRIMARY                     *[ SELECT A ]
 @ 13,42 SAY STR((#+1),4,0)         *[ AT 13,42 SAY STR(RECNO(),4,0) ]
 APPEND BLANK
 REPLACE title WITH TRIM(Mtitle), eubject MITH TRIM(Meubject);
 vol WITH Mvol, no MITH Mno, page MITH Mpage
 SELECT SECONDARY                   *[ SELECT B ]
ENDDO while .not.  eof
@ 13,25 BAY "Adding Authors and Categoriae"
BELECT SECONDARY                    *[ SELECT C ]
USE tempB
APPEND FROM VOL&V.H&N..TXT SDF
DELETE ALL FOR category=" " .AND. author=" "
PACK
*-------------------------------------------------------------------------
* ORIGINAL PROGRAM SECTION TO BE REPLACED BY MODIFICATION
*
BELECT PRIMARY                      *[ SELECT A ]
GO TOF
SET LINKAGE ON                      *[ HET RELATION TO RECBO() INTO C ]
REPLACE ALL author WITH E.author;  *[ REPLACE ALL euthor with C->author;
   cetagory WITH S.cetegory                cetegory WITB C->cetegory ]
SET LINKAGE DFF                     *[ SET RELATION ]
*-------------------------------------------------------------------------
@ 13,25 SAY "       HOUBEEEEPING          "
USE tempA                           *[ BELECT B ]
DELETE ALL                          *[ ZAP ]
PACK                                *[ DELETE THIS LINE FOR DBASE III ]
BELECT BECONDARY                    *[ SELECT C ]
DELETE ALL                          *[ ZAP ]
PACE                                *[ DELETE THIS LINE FOR DBASE III ]
ERABE                               *[ CLEAR ]
CLEAR                               *[ CLEAR ALL ]
QUIT
* end of program

-------------------------------------------------------------------------
* NEW REPLACEMEBT EECTION
GO TOP
SELECT FRIMARY                      *[ SELECT A ]
LOCATE FOR eutbor="  " .AND.  cetegory="  "
DO WSILE .NOT.  EOF                 *[ EOF () ]
 REPLACE euthor WITH S.author;      *[ REPLACE autbor MITH C->author;
   cetagory MITH S.category                cetegory WITH C->cetegory ]
 SEIF
 SELECT SECONDARY                    *[ SELECT C ]
 SKIP
 SELECT PRIMARY                      *[ SELECT A ]
ENDDO
-------------------------------------------------------------------------
```

Figure 2: *Using the revised PCMAGNDX.PRG shown above will result in more accurate record alignment. Modifications for both* dBASE II *and* III *are shown.*

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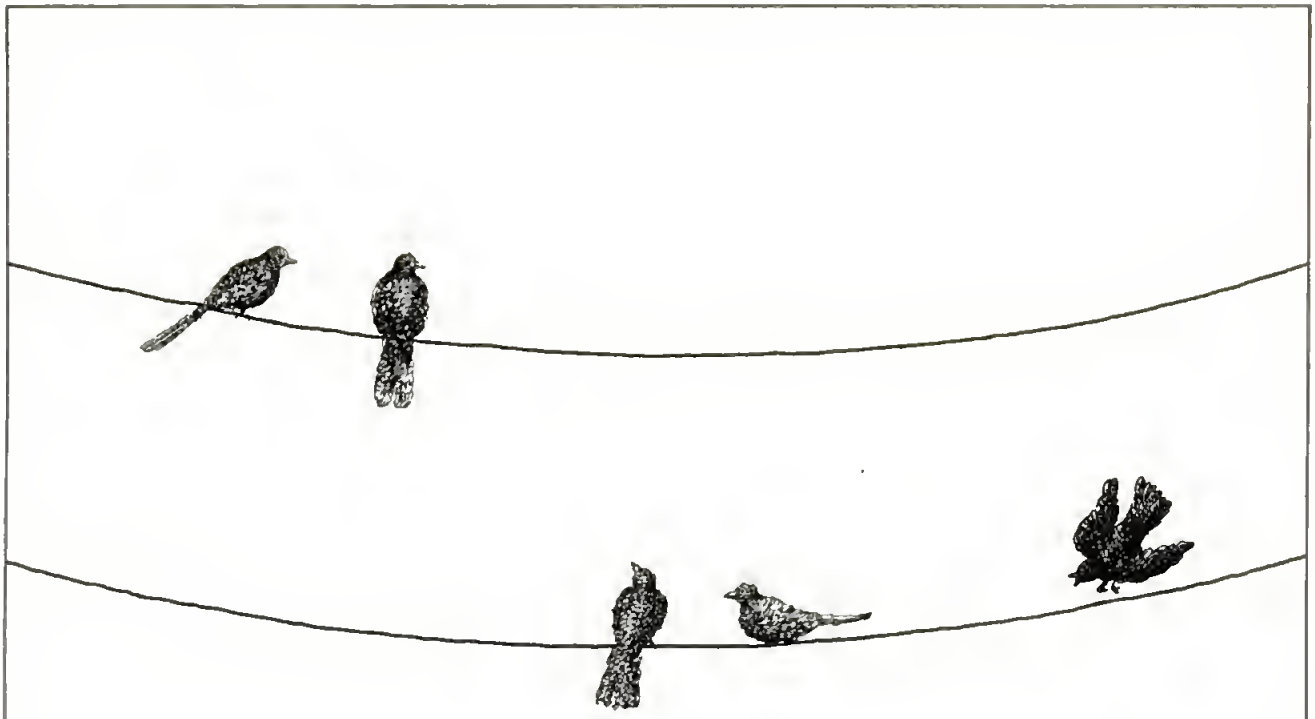

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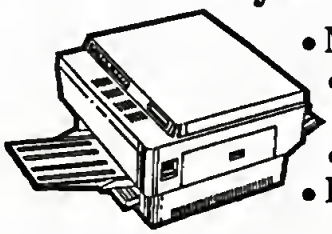

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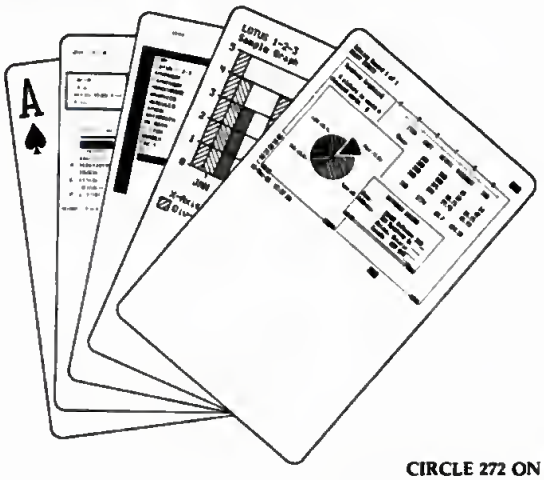

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■ Though the revised PCMAGNDX.PRG will run a trifle more slowly than the original, it will accurately align the various parts of the index files.

PCMAGNDX.PRG allows dBASE *users to create a database from the ASCII index files of* PC Magazine *articles currently listed on our on-line Interactive Reader Service. While several suggestions for improving PCMAGNDX.PRG have been made previously, Mr. Brown's solution does indeed fix one problem inherent in the way the program originally worked. Though the revised PCMAGNDX.PRG will run a trifle more slowly than the original (because it uses* dBASE's *notoriously slow LOCATE statement to reposition the record pointer before appending records), it will accurately align the various parts of the index files into coherent records.*

We have already replaced the old PCMAGNDX.PRG on our Interactive Reader Service with Mr. Brown's revision. For the many readers who already have PCMAGNDX.PRG on their disks, Figure 2 shows the original code and the section that should be replaced with the new subroutine. The program is written in dBASE II. *For use with* dBASE III, *substitute the text within the brackets on the right for the program code shown on the left.*—David Obregón

C SCREEN CONTROL

After getting copies of the Microsoft C Compiler, Version 3.00, and Mark Williams's Let's C, Version 3.02, I was disappointed that clear screen and cursor positioning functions were not included. I therefore wrote two functions, `gotoxy` and `cls`. Both work the same way as the corresponding BASIC and Turbo Pascal

```
/* C Functions for screen control */

#include <dos.h>
union REGS rege ;

main ()
        {
        int     i ;

        cls () ;
        for (i = 0; i < 25; i += 5)
                {
                gotoxy (i,0) ;
                cprintf ("This is printed on row %d", i) ;
                }
        }

cls ()
        {
        rege.e.ax = 0x0600 ;    /* Blank window */
        rege.e.cx = 0 ;         /* Upper left   */
        rege.e.dx = 0x184F ;    /* Lower right  */
        rege.h.bh = 7 ;         /* Attribute    */
        int86 (0x10, &rege, &rege) ;
        }

gotoxy (row, col)
        int row, col ;
        {
        rege.h.ah = 2 ;         /* Set cursor   */
        rege.h.dh = row ;
        rege.h.dl = col ;
        rege.h.bh = 0 ;         /* Video page   */
        int86 (0x10, &rege, &rege) ;
        }
```

Figure 3: *One way to do cursor movement and control the screen in C is to write your own functions using BIOS calls. The ones shown in this figure are written specifically for the Microsoft C Compiler, Version 3, but similar routines could be adapted for any compiler that allows direct interrupt calls.*

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■ POWER USER

functions. They use the PC BIOS routines called with the `int86` function included with the Microsoft C Compiler. Similar routines could be written for Let's C using the `intcall` function.

Thomas J. Jones
Aptos, California

A demonstration program using Mr. Jones's functions is shown in Figure 3.

Microsoft didn't include screen control in its C compiler for a very good reason. The compiler is for a generic MS-DOS computer, and Interrupt 0x10 really has nothing to do with MS-DOS. It may be true that the vast majority of MS-DOS computers are IBM PCs and compatibles (which support screen control through the PC BIOS Interrupt 0x10), but generic MS-DOS programs must run on non-PC-compatibles as well.

If you're writing programs for yourself, for the PCs in your company, or for PC-compatibles, then using Interrupt 0x10 is fine. For programs that must run on other MS-DOS computers, a better alternative is to use ANSI control sequences. C macros that position the cursor and clear the screen using ANSI are shown in the demonstration program in Figure 4. One advantage of using this approach is that the ANSI clear screen preserves the current attribute. Note that the row- and column-numbering scheme begins at 1 rather than 0 as in the ROM BIOS. For the IBM PC and compatibles, the program in Figure 4 requires that the line DEVICE=ANSI.SYS be included in the CONFIG.SYS file.

```
/* C Macros for ANSI ecreen control */

#define GOTOXY(row,col) cprintf ("\x1B[%d;%dH", row, col)
#define CLS             cpute   ("\x1B[2J")

main ()
        {
        int     i ;

        CLS ;
        for (i = 1; i < 25; i += 5)
                {
                GOTOXY (i,1) ;
                cprintf ("Thie is printed on row %d", i) ;
                }
        }
```

Figure 4: *Another approach to controlling the screen in C is with ANSI control sequences. On PCs, ANSI.SYS must be installed as a device driver at boot time for this program to work.*

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Even if you have no intention of porting your C programs to other computers or operating systems, it's always a good idea to isolate the machine-dependent code (such as screen control) into separate libraries or header files. You might also investigate the availability of existing C libraries for working with the PC display. I've seen some ads for a PC version of the UNIX `curses` *library for cursor and screen control. That's probably the best bet if portability is a concern.*

■ It's always a good idea to isolate the machine-dependent code into separate libraries.

A note to beginning C programmers: Although the more common `printf` *and* `puts` *function could be substituted for* `cprintf` *and* `cputs` *in these two examples, you'll find that their use will increase the size of the resultant .EXE file. In the Microsoft C compiler the* `cprintf` *and* `cputs` *use the* `putch` *function, which in turn writes to the display through the low-level DOS function call 0x08. (Note also that the 0x prefix means "hexadecimal" in C.) This requires less code than the* `printf` *and* `puts` *functions, which ultimately use DOS function call 0x40 to write to standard output and thus require a bunch of file I/O code.*—Charles Petzold

DEBASED STATISTICAL PROGRAM

*In the Power User item "*dBASE *Statistical Functions" (*PC Magazine, *Volume 5 Number 1), a transcription error occurred in the listing of Robert Arkell's excellent program. The line that reads*

```
STORE (TSUM-BSUM)/(N/2) TO SD
```

should instead read

```
STORE (TSUM-BSUM)/(A/2) TO SD
```

We much regret the error and any inconvenience it caused.—David Obregón

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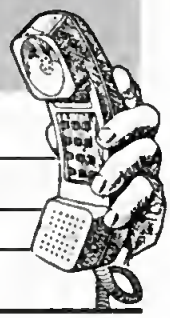

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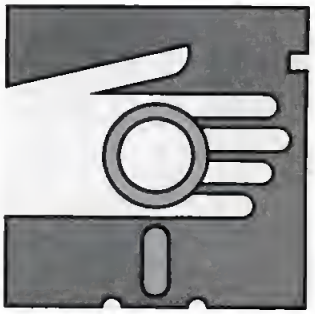

USER-TO-USER

PC Magazine's readers share their favorite tricks for getting the most horsepower out of DOS, BASIC, and their systems in general.

SPEEDIER AT KEYBOARD

I tried the AT keyboard tricks recommended by Dan Rollins in User-to-User, Volume 4 Number 19, and was happy to have a cursor that speeds along at a rate proportional to the computer's capabilities.

But since I hate BASIC and wanted to include the speed change in my AUTOEXEC file, I wrote a .COM file called FASTKB.COM that will set the keyboard delay to 0.25 second and repeat rate to 20 per second. To create this file, type in everything underlined below, hitting the Enter key at the end of each line, including the one after the RET.

```
C>DEBUG
-A 100
xxxx:0100 MOV  AL,F3
xxxx:0102 OUT  60,AL
xxxx:0104 MOV  CX,1000
xxxx:0107 NOP
xxxx:0108 LOOP 0107
xxxx:010A MOV  AL,04
xxxx:010C OUT  60,AL
xxxx:010E RET
xxxx:010F
-RCX
CX 0000
:F
-NFASTKB.COM
-W
Writing 000F bytes
-Q
```

The LOOP at addresses 104 to 108 is to wait for the keyboard interface to react to the first OUT instruction.

To change the settings from 0.25/20 to other values, replace the 04 value at address 10A by the appropriate value from the table in Figure 1. The values are computed from the data given in the IBM AT *Technical Reference* manual.

Robert Patenaude
Pierrefonds, Quebec, Canada

delay (second)		0.25	0.50	0.75	1.00
repeat (per second)	30.0	00	20	40	60
	26.7	01	21	41	61
	24.0	02	22	42	62
	21.8	03	23	43	63
	20.0	04	24	44	64
	18.5	05	25	45	65
	17.1	06	26	46	66
	16.0	07	27	47	67
	15.0	08	28	48	68
	13.3	09	29	49	69
	12.0	0A	2A	4A	6A
	10.9	0B	2B	4B	6B
	10.0	0C	2C	4C	6C
	9.2	0D	2D	4D	6D
	8.6	0E	2E	4E	6E
	8.0	0F	2F	4F	6F
	7.5	10	30	50	70
	6.7	11	31	51	71
	6.0	12	32	52	72
	5.5	13	33	53	73
	5.0	14	34	54	74
	4.6	15	35	55	75
	4.3	16	36	56	76
	4.0	17	37	57	77
	3.7	18	38	58	78
	3.3	19	39	59	79
	3.0	1A	3A	5A	7A
	2.7	1B	3B	5B	7B
	2.5	1C	3C	5C	7C
	2.3	1D	3D	5D	7D
	2.1	1E	3E	5E	7E
	2.0	1F	3F	5F	7F

Figure 1: *Delay and repeat rate values for AT keyboard speedup program.*

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This method is foster (so much so that it won't work without the delay loop) and more efficient than other methods we've published. We now use this .COM file, changed so the 04 in the MOV AL,04 line is an even speedier 0.

DUMMY NUMBERS

It's often difficult to trace the flow of BASIC programs that contain lots of GOTO statements. One way to make this process considerably easier is to use a technique I call backtracking. If lines 300, 500, and 700 all contain a GOTO 900, simply insert a line 899 that says

```
899 ZZ=9:ON ZZ GOTO 300,500,700
```

ZZ can be a numbered junction point in a program flow chart, or it can be a dummy number. However, it must be larger than the number of program lines after the GOTO. (In the above case there were three line numbers after GOTO, so ZZ could have just as easily been equal to 4.)

This trick lets you figure out which possible lines sent the program execution to that point. And, most important, this survives renumbering. You might want to think of the GOTO as "may have come from."

David V. Messman
Atlanta, Georgia

This is o voriotion of on old trick to start off all your programs with a cascade of unused GOTOs with descriptive REM stotements following them. For instance, you could identify the setup, main loop, etc., parts of your program by beginning your code with the lines

```
100 GOTO 170
110 GOTO 160 'SETUP
120 GOTO 300 'MAIN LOOP
130 GOTO 350 'INPUT ROUTINE
140 GOTO 400 'ERROR TRAPS
150 GOTO 500 'PRINTER
160 '= SETUP STARTS NEXT LINE =
170 DEFINT A-Z:CLS
```

The initial GOTO 170 in line 100 jumps the progrom execution oround oll the lines from 110 through 160, which contoin remarks that label the various parts of your progrom ond which will continue to refer to the proper lines even after renumbering.

Renumbering can often cause devastating results if done too casually. One of the most dreaded messoges on the screen is an "Undefined line 620 in 850" right ofter you've just removed 20 lines of code; ofter renumbering, these two line numbers could be anywhere. And if you don't cotch the missing line, your progrom is destined for doom. Tracking down such missing line references con toke hours in o long program, especially if there are several at once.

The obvious solution, of course, is to sove eorly ond often, especiolly right before you start meddling with the code. Then, if the renumbering process uncovers undefined lines, you con load the previous version ond stort again.

A crafty solution that's been oround for some time is to type in two very high dummy RENUM numbers before you try the real thing. If your code is short, typing in RENUM 9999,9999 will uncover undefined lines before octually changing onything. This gives you o chance to correct the mistoke before it's too lote. If your program is larger, you might have to use RENUM 65000,65000. One advontoge of the shorter technique is thot you con put the whole RENUM 9999,9999 on o single function key—to do this to F10, odd a line ot the beginning of your program thot soys

```
10 KEY 10,"RENUM 9999,9999"
```

Unfortunately, since BASIC will assign a maximum of 15 keystrokes to eoch function key and the new definition is exoctly 15 charocters long, you'll have to hit the Enter key ofter hitting F10.

MAGIC BORDER CREATOR

Drawing borders with IBM's high-bit character set can take forever, especially when you're in the middle of an application such as *R:base 5000*. To produce each character directly on-screen, you have to hold down the Alt key, type in the three-digit ASCII value of the border character on the number pad, and then release the Alt key. A simple box can take several minutes to produce.

The keyboard macro programs I tried wouldn't make it any easier, and ANSI.SYS worked poorly, since it forces you to return to DOS and then execute a batch file every time you want your keyboard back. So I wrote a program called BOXDRAW.COM that stays resident in memory while other application programs can

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run on top of it. BOXDRAW replaces the normal BIOS keyboard-support routine so that it can check on characters being transferred from the input buffer to any application in use during keystroke requests.

Create the program by running BOXDRAW.BAS in Figure 2. Then load BOXDRAW.COM before any of your application programs, simply by typing BOXDRAW. You can then toggle BOXDRAW on and off by hitting Alt-B (holding down the Alt key and hitting B).

Once you've toggled the program on, you can select among four separate palettes of border characters by typing the capital letters A, B, C, or D. A yields all-thin border characters. B produces all-thick ones. C and D will give you combinations of these (thick horizontals/thin verticals, and thin horizontals/thick verticals, respectively).

To print the actual characters, make sure the CapsLock and NumLock keys are

```
100 ' Program for creating BOXDRAW.COM
110 PRINT "Checking DATA statements; please wait..."
120 FOR B=1 TO 21:FOR C=1 TO 17
130 READ A$:IF C<17 THEN 150
140 Z#=Z#+VAL(A$)
150 NEXT:NEXT
160 IF Z#=35905! THEN RESTORE:GOTO 190
170 PRINT "WRONG AMOUNT OF DATA STATEMENTS, OR ERROR IN BIG"
180 PRINT "NUMBER AT THE END OF A LINE -- CHECK AND REDO!":END
190 FOR B=1 TO 21:FOR C=1 TO 16
200 READ A$:TTL=TTL+VAL("&H"+A$)
210 NEXT
220 READ S:IF S=TTL THEN 250
230 PRINT "DATA ERROR IN LINE";B*10+300
240 PRINT "CHECK FIGURES AND REDO":END
250 TTL=0:NEXT:RESTORE
260 OPEN "BOXDRAW.COM" AS #1 LEN=1:FIELD #1,1 AS D$
270 FOR B=1 TO 21:FOR C=1 TO 16
280 READ A$:LSET D$=CHR$(VAL("&H"+A$))
290 PUT #1:NEXT:READ DUMMY$:NEXT:CLOSE
300 PRINT "BOXDRAW.COM CREATED"
310 DATA E9,27,01,FB,53,1E,BB,40,00,8E,DB,0A,E4,74,1E,FE,1887
320 DATA CC,74,06,A0,17,00,EB,12,90,FA,8B,1E,1A,00,3B,1E,1440
```

(Figure 2 continues)

Figure 2: *Program to create BOXDRAW.COM. Run the .COM program in DOS by typing BOXDRAW, then toggle it on by typing Alt-B. Turn the CapsLock and NumLock keys on, then select a character palette by typing (capital) A, B, C, or D. Then use the cursor-pad box to draw the appropriate box characters. The Plus key will draw vertical bars, while the Minus key draws horizontal bars.*

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```
330 DATA 1C,00,0B,07,FB,1F,5B,CA,02,00,1F,5B,CF,FB,0B,1E,1500
340 DATA 1A,00,3B,1E,1C,00,74,F5,FA,0B,07,43,43,3B,1E,02,1253
350 DATA 00,75,04,0B,1E,00,00,09,1E,1A,00,0C,CB,0E,DB,2E,1361
360 DATA 00,26,27,01,3C,00,75,1B,00,FC,30,74,03,E9,93,00,1345
370 DATA B4,01,2E,2A,26,20,01,2E,00,26,20,01,BB,40,00,0E,1002
380 DATA DB,EB,BA,2E,0A,26,28,01,00,FC,01,74,03,EB,74,90,1890
390 DATA 3C,41,75,03,EB,5F,90,3C,42,75,03,EB,50,90,3C,43,1559
400 DATA 75,03,EB,51,90,3C,44,75,03,EB,4A,90,2E,0A,26,29,1544
410 DATA 01,00,FC,00,75,06,BB,FB,00,EB,1A,90,00,FC,01,75,1045
420 DATA 06,BB,06,01,EB,0F,90,00,FC,02,75,06,BB,11,01,EB,1539
430 DATA 04,90,BB,1C,01,3C,2D,75,05,B0,09,EB,14,90,3C,2B,1270
440 DATA 75,05,B0,0A,EB,0B,90,3C,31,7C,10,3C,39,7F,14,2C,1263
450 DATA 31,D7,EB,0F,90,2C,41,2E,A2,29,01,BB,40,00,0E,DB,1629
460 DATA E9,3A,FF,2E,0A,26,27,01,E9,2F,FF,C0,C1,D9,C3,C5,2337
470 DATA B4,DA,C2,BF,C4,B3,C0,CA,BC,CC,CE,B9,C9,CB,BB,CD,3139
480 DATA BA,D4,CF,BE,C6,D0,B5,D5,D1,B0,CD,B3,D3,D0,BD,C7,3107
490 DATA D7,B6,D6,D2,B7,C4,BA,00,00,00,FA,B0,90,90,2E,A3,2317
500 DATA 00,01,2E,A2,02,01,2B,C0,0E,D0,B0,03,00,A3,50,00,1243
510 DATA 0C,C0,05,10,00,A3,5A,00,FB,BA,2A,02,CD,27,00,00,1339
```

(Figure 2 ends)

both on and that you've toggled Alt-B on as well. Then just use the number pad and the plus and minus signs to draw the boxes. The upper lefthand corner of the number pad (key 7/Home) will draw the upper lefthand corner of a box on your screen; the lower righthand corner of the number pad (3/PgDn) will produce the lower righthand box character on-screen, etc. The minus sign will draw a horizontal bar and the plus a vertical bar.

To disable BOXDRAW, just hit Alt-B when you're done to toggle it off. This works with most of the programs I've tried except for Lotus's *Symphony*.

Tapio K. Vocadlo
Beaconsfield, Quebec, Canada

This interesting program makes drawing borders a breeze. You can change the characters it draws by using DEBUG to substitute others (shading characters, Greek letters, etc.). If you try this, the first palette (characters 192, 193, 217, 195, 197, 180, 218, 194, 191, 196, and 179) runs from addresses &H1FB through &H205, the second palette (characters 200, 202, 188, 204, 206, 185, 201, 203, 187, 205, and 186) runs from addresses &H206 through &H210, the third palette (characters 212, 207, 190, 198, 216, 181, 213, 209, 184, 205, and 179) runs from addresses &H211 through &H21B, and the fourth palette (characters 211, 208, 189, 199, 215, 182, 214, 210, 183, 196, and 186) runs from addresses &H21C through &H226.

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■ USER-TO-USER

BATCH REFINEMENTS

Long batch files tend to execute slowly, especially on floppy systems. This is especially pronounced if the batch files contain lots of REM or ECHO statements. You can speed up execution of such batch files two ways.

First, instead of using repeated ECHO statements to put long messages on-screen, have the program instead TYPE the contents of several small message files on the same disk. This also lets you create attractive, centered screens with borders, arrows, etc.

Second, instead of using REMs to insert nonprinting comments, turn such comments into labels by putting a colon at the beginning of the line. These look neater than REMs and will not print to the screen regardless of whether ECHO is off or on.

Gregory E. Borter
Ocala, Florida

Using colon label-markers not only speeds things up but is an easy way to prevent nonprinting comments and instructions from appearing on-screen. Incidentally, it's true that typing comment files beats using ECHO to print them one line at a time, but if you're using a floppy system, put the files to be typed and the batch file itself together at the beginning of the disk or you'll end up with much slow, noisy "thrashing" as the head bounces back and forth hunting down the files to type and then scrambling back to the master batch file. Better still, get a hard disk; they're really coming down in price.

OOPS

The SCROLL.BAS program in Volume 5 Number 3 scrolls down properly but not up. However, there's a simple fix. Change the UD$ variable in line 250 to I$ and the program will work as advertised.

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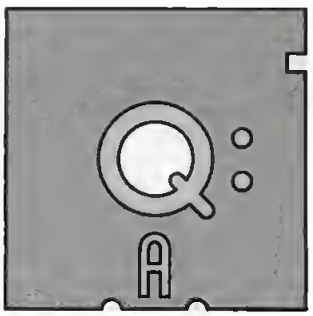
PC TUTOR



PC Tutor answers your questions on everything from programming and operating systems to hardware and applications software.

BASIC GRAPHICS ON THE MOVE

I would like to program games that I could play on the IBM PC, but I can't find out how to make graphics other than the LINE command and the CIRCLE command. Is there another way I can generate graphics in BASIC?

An 11 year old in need of help,
Kevin Carr
Dallas, Texas

Graphics have become an increasingly important part of software packages. If you master games at 11, you'll be doing dynamite business applications at age 22.

The usual procedure in BASIC is to draw an object using a combination of LINE, CIRCLE, PSET (for individual dots), and DRAW (for complex figures). Next, read the object drawn on the screen into an array, using the GET statement. Once you have an object stored in an array, you can move it around the screen with the PUT statement. Figure 1 shows a small BASIC program that draws a rather crude Mercedes Roadster with me behind the wheel (I wish), so I can drive it across the screen.

A good way to learn programming is to study other people's programs. You might want to dig down into the BASIC programs included with PC-DOS for some graphics techniques. In particular, the DONKEY .BAS game—dumb as it may be—contains most of the principles of programming moving graphics in BASIC.

```
100 SCREEN 1 : COLOR 17,0 : CLS
110 DIM CAR%(122) : KEY OFF
120 LINE (0,100)-(25,106),3,BF 'car body
130 CIRCLE (3,108),3,1         'rear tire
140 CIRCLE (22,108),3,1        'front tire
150 LINE (20,100)-(18,94),1    'windshield
160 CIRCLE (13,97),2,2         'driver
170 GET (0,94)-(25,111),CAR%   'read car
180 FOR X% = 0 TO 285 STEP 5
190   PUT (X%,94),CAR%         'erase car
200   PUT (X% + 5,94),CAR%     'draw car
210   SOUND 37+X%/10,3-X%/100  'engine noise
220 NEXT X%
```

Figure 1: *A BASIC program to demonstrate moving graphics. The program draws a car, reads it into an array, and then drives it across the screen.*

SUPERCHARGING JUNIOR

I use a PC*jr* and have a question that may be of interest to many PC*jr* owners. In a recent article ("Striving for Practical Perfection," *PC Magazine*, Volume 4 Number 16), Peter Norton mentioned that if he could have things his way, he would increase the clock speed on the PC AT. I'd like to know if it is possible to increase the clock speed on the PC*jr* and, if so, how you go about it? I'm hoping a little kick in the pants might improve the PC*jr*'s performance.

Mark W. Hall
West Bloomfield, Michigan

In short, no it isn't. But you can learn a few things from "no" answers, so I won't stop at a simple denial.

In PC News ("AT Speed Thrills on Cheap Crystal," PC Magazine, Volume 4 Number 4, page 35), Bill Harts showed how PC AT owners can replace the 12-MHz crystal in the AT with a 16-MHz crystal and thereby increase processor speed by a third (along with voiding your warranty, possibly damaging your machine, and forever wondering if the strange things that your brand-new expansion card does are because of your speed greed). [We have not yet heard of anyone's actually harming his AT by using the faster crystal.—Ed.]

*This little trick cannot be pulled on a regular PC, PC-XT, or PC*jr*, however. These machines use a 14.31818-MHz crystal. That frequency is divided by 3 to get the 4.77-MHz clock signal used for the 8088 microprocessor. The first reason for not using a higher-frequency crystal is that the normal 8088 is rated for only 5 MHz; 4.77 MHz is nearly at that maximum already. If you get too far above it, the microprocessor may not work at all.*

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■ PC TUTOR

On the PCjr system board, the 14.31818-MHz frequency is divided by 4 to get the 3.58-MHz color-burst signal required for your display. (On the PC and XT, the 3.58-MHz signal is available on the bus, but the color/graphics adapter derives its own 3.58-MHz clock from the 14-MHz clock also on the bus.)

And if it's not enough that you won't be able to use your display, the basic 14-MHz clock is divided by 6 to get 2.38 MHz and then by 2 to get 1.19 MHz, which drives the 8253 timer chip. Thus, with a faster crystal you won't be able to tell what time it is, either. Nor should you forget abaut the PCjr's serial printer port and the internal modem, because the 14 MHz is divided by 8 to get the 1.7895 MHz used for the baud clock.

So how do PC AT owners get away with supercharging their machines with such relative impunity? Simple: The AT system board has a separate 14.31818-MHz crystal used to generate the normal clock rates that PC peripherals have come to know and rely on.

Althaugh the processor speed of the PCjr is the same as the PC and PC-XT, disk access is slower because of the lack of direct memory access (see the answer to "A DEBUG Oddity," in PC Tutor, PC Magazine, Volume 4 Number 24). To satisfy your original desire to give a little kick to the junior, however, you might try using a RAMdisk for heavy compilations, database management, and word processing. You mentioned in your original letter that your PCjr has 512K bytes, so you can probably fit a 160K RAMdisk in with no problem. While the DOS 2.1 Technical Reference manual lists a VDISK program, you'll do better upgrading to DOS 3.1, which has a VDISK.SYS program all ready to use.

A 370 IN A PC

I have a question about IBM's 370 option kit for the AT or XT. What exactly does the 370 processor do, and why does the option cost about $3,800?

Johann Weber
New York, New York

The XT/370 was introduced over 2 years ago, about the same time as the PCjr and the 3270-PC. All three machines were discussed in PC Magazine, *Volume 3 Number 1, which is interesting to reread in retrospect. At the time, various industry experts predicted that the arrival of the XT/370 signaled the end of open architecture for the PC, indicated a strong trend toward UNIX, and spelled death for the IBM-compatible market. Said one IBM watcher: "We don't know how bad it's going to be until we see the bodies start floating to the surface." Fortunately, of course, it hasn't been all that bad.*

■ AT owners can speed up their machines because the AT system board has a separate 14.31818-MHz crystal to generate the normal clock rates that PC peripherals rely on.

In the same issue, a PC Magazine *contributing editor predicted that the PCjr would have a bigger and more profound impact than the original PC. This is a tough industry in which to make accurate predictions, however, and since people who attended the XT/370 press conference still speak of the machine in awed tones, the fervor at the time is not surprising.*

The XT/370 and AT/370 get their names from IBM's System/370. Introduced by IBM in 1970, the System/370 still dominates the mainframe world. Its primary advantage over the previous System/360 (introduced in 1964) is the support of virtual memory. *Virtual memory involves swapping chunks of memory to and from disk storage. This makes it appear as if the machine's usable memory capacity is much larger than it actually is.*

Rudimentary forms of virtual memory have been used in a number of PC programs. For example, "overlay" (.OVL) files are sometimes used to hald parts of a program on disk until they are actually needed. When they are loaded, they tem-

porarily overwrite other program parts that are not needed at the moment. (The .OVL technique was more commonly used in programs written for older 64K machines than with 640K PCs.) Multitasking systems such as Microsoft Windows *also use temporary disk storage to keep more programs active than could fit into available memory.*

(More commonly used with today's PCs, however, is the virtual disk. *Here, rather than use disk storage to simulate extra memory, PC users with more memory than they need can make their excess memory electronically emulate a disk.)*

■ In the System/370, IBM extended the virtual memory technique even further, creating the concept of a virtual machine that would support multiple users.

In the System/370, IBM extended the technique of virtual memory even further, creating the concept of a virtual machine *that would support multiple users on a time-sharing system. By using virtual memory and keeping continuous track of the CPU registers, the VM/370 operating system can make the entire computer seem dedicated to each user. Each user has the illusion of having access to all resources under the single-user operating system VM/CMS (Conversational Monitor System).*

This allows the simultaneous execution of many programs that in total use much more memory than the computer actually has. Of course, in a time-sharing system the use of the machine is divided among the users in tiny time-slices; so while the entire resources of the machine are simulated, the raw speed of the machine is not. This causes many 370 mainframe time-sharing users, who age visibly while waiting for their programs to run, to yearn for something else.

The 370 option for the XT and AT is not exactly the 370 on a chip, but it's almost a 370 on three expansion boards. The first board contains two Motorola 68000 microprocessors (one customized by IBM) and an 8087 floating-point coprocessor. The second board contains the memory. The third board provides emulation of a 3270-type mainframe terminal for downloading and uploading programs and data. IBM's $3,800 price for this hardware seems consistent with the rest of its pricing.

The XT/370 and AT/370 hardware requires the VM/PC operating system. (This costs another $1,000, so don't complain about the price of your next PC-DOS upgrade.) When combined, the hardware and software package essentially turns the PC into a single-user System/370 with 4 megabytes of virtual memory. Thus, the 370 option can run many VM/CMS programs on the PC that previously could be run only on a mainframe. The machine can also concurrently emulate a 3270-type mainframe terminal and run a 3101 emulation package for communicating with a 370 mainframe through a modem over the telephone lines.

For a large corporation or other institution with a 370 mainframe, the 370 option can take some of the load off the big machine by allowing applications to be developed and run locally. A smaller company with branch offices can maintain a System/370 in the main office and put XT/370s (or AT/370s) in the branches. All can run the same software, which is convenient, and data can be transmitted over the telephone lines.

For individuals, however, the 370 option for the PC is not nearly as attractive. Although you'd be able to run mainframe software on your PC, their prices make PC software look like a real bargain. Moreover, PC-DOS is a piece of cake compared with finding your way around mainframe operating environments.

The PC Tutor solves practical problems and explains points of general interest. To see your question answered here, drop a line to PC Tutor, *PC Magazine*, One Park Avenue, New York, NY 10016. ■

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PC MAGAZINE REVIEWS IN BRIEF

PDI464: A Board with a Unique RAMdisk

BY JIM FORNEY

Pure Data Ltd. has made a good thing even better. Its PDI464 Multifunction Board series has been upgraded to permit the IBM PC to enjoy a memory capacity of up to 832K bytes of addressable RAM. Though this is basically the same multifunction board it has been marketing right along—populated with two banks of cool-running 256K-byte chips, one of 64K-byte chips, and a bank to spare for the full 832K bytes—one lone ROM chip has been replaced with spectacular results. Extra memory is only one of the plus features of the PDI464 cards.

Available either with two serial ports (PDI464SS) or one parallel and one serial port (PDI464SP), the boards also include a unique clock/calendar that resets when you respond to standard DOS TIME and DATE commands, instead of requiring a separate time-setting utility (as many boards do). This built-in calendar can function as an appointments calendar that automatically displays your appointments for that day and up to a week from that day whenever you boot up.

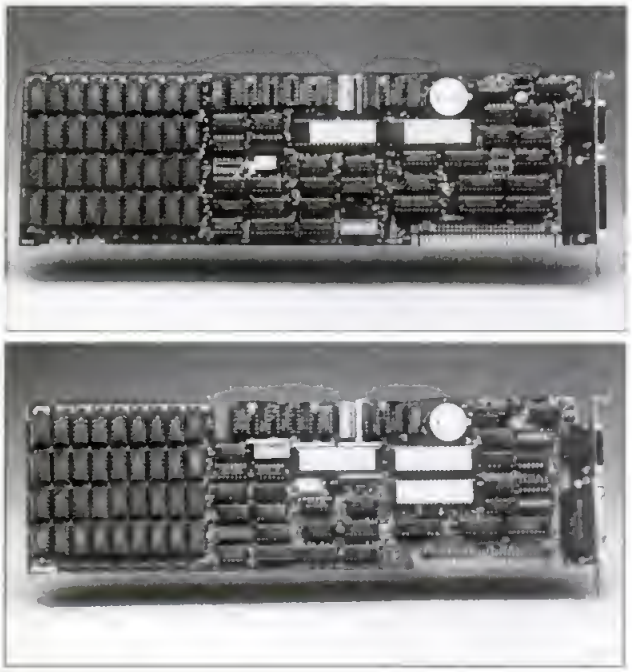
The Pure Data boards also support one of the neatest RAMdisks I've seen—this RAMdisk survives a warm reboot with all its data intact. If you must hit Ctrl-Alt-Del to get out of a jam, you won't lose anything stored in this card's memory. In a hard crash that requires a cold restart you're still dead, of course, but fortunately those come rather infrequently. In months of hard use and hundreds of crashes, the PDI RAMdisk has come through with flying colors. A side benefit of Pure Data's support software, by the way, is a quick booting routine that shaves off a minute or so when you cold boot.

Other software supplied with the PDI464 board supports print spooling and very critical diagnostic RAM checks if you really want to check your system thoroughly. And speaking of support, if you do need technical support for a Pure Data product, a phone call gets you the same fellows who perform the final inspections on every board before it leaves the factory. It's an unusual practice but it really works—which is just what I'd say about a PDI464. ■

PC MAGAZINE FACT FILE

PDI464SS/SP
Pure Data Ltd.
860 Denison St.
Markham, Ontario, Canada
L3R 4H1
(416) 475-3370
List Price: PDI464SP: with 64K RAM, $395; with 384K RAM, $550; PDI464SS: with 64K RAM, $445; with 384K RAM, $595
In Short: These unusual multifunction boards provide on-board memory to 576K bytes, a unique clock/calendar, and software support for a warm reboot-proof RAMdisk.

CIRCLE 617 ON READER SERVICE CARD



The PDI464 SP and SS boards from Pure Data Ltd.

Turbo-Cool: Keeping Your PC from Overboiling

BY JIM FORNEY

After years of slaving over hot circuitry, my faithful, overloaded IBM PC is running at least 15 degrees cooler these days thanks to an add-on cooling fan called Turbo-Cool from PC Cooling Systems. Turbo-Cool (formerly known as "Silencer, model HP") bolts onto the back of the PC over the power supply's exhaust grill, drawing up to 100 percent more air through the unit.

Prior to installing the Turbo-Cool, I measured a 30-degree temperature rise above ambient room temperature with a temperature probe positioned just above the motherboard and tucked in between two expansion boards. With Turbo-Cool installed and the temperature probe in the same location, the temperature rise was cut exactly in half—a mere 15 degrees hotter than my room—and the top of the PC's cabinet was significantly cooler to the touch at the hottest point (just above the location of the probe). Although "Silencer"—the name under which it was originally marketed—was a misnomer, Turbo-Cool's fan is much quieter than IBM's built-in cooling fan. In fact, there is no significant increase in the noise level with Turbo-Cool running.

Installation couldn't be easier, as it does not require going inside your computer at all. To install Turbo-Cool on a PC or XT, all you have to do is remove four screws from the back panel that secure the power supply in place. Then you simply attach the fan unit by inserting the longer screws supplied with it back into the same holes. The Turbo-Cool unit is just 3 inches thick and adds that much to the depth of a PC when installed,

but in terms of required clearance behind the CPU, it doesn't add much beyond what you would normally leave to prevent kinking all those connecting cables anyway.

The fan is supplied with a "Y" power cable, one end of which plugs into the monitor outlet on the back of the computer so that Turbo-Cool turns on automatically when you start your system. The other end of the Y has a monitor receptacle similar to the one that the fan has taken, so none of the original functionality is lost.

I've overheated my computer more than once, especially in hot weather. Heat can be a major problem and can cause all manner of strange things to happen, as well as shortening the lifespan of all those expensive plug-in boards and gizmos you've added to your system. This looks like it's about as slick a way to keep the bugs away on a hot night as any I've seen. ■

PC MAGAZINE FACT FILE

Turbo-Cool
PC Cooling Systems
31510 Via Ararat
Bonsall, CA 92003
(619) 723-9513
List Price: $79.95

CIRCLE 616 ON READER SERVICE CARD

Organizing Your Finances: hBudget

BY VICTORIA DANOFF

hBudget is a savvy personal accounting program from Oak Park Software Inc. that does much more than just balance your checkbook. When used on a week-to-week basis, it also offers you financial planning, budgeting, and cash-flow projection capabilities. It's not for everyone, though, especially if you tend to procrastinate about money matters. Moreover, you can't do any of the "fun stuff"—that is, make use of such advanced functions of *hBudget* as calculating monthly expenses and projecting your cash flow—until you build up your database of completed and budgeted transactions.

To get the most value from this software, you must have your financial records in order before you start or be willing to take the time to organize your recordkeeping—nothing more elaborate, mind you, than gathering all your account statements into a shoebox or desk drawer, but to some, even this small task is an ordeal. And you must be willing to spend at least 2 hours per week on data maintenance sessions, recording your income and expenses.

hBudget accommodates all levels of computer and accounting expertise. Of course, the more you know, the faster you graduate from reading the manual to experimenting with the practice data disk, one of the five non-copy-protected disks included in the package (there are also three program disks and one for installing the software for your system). For the initiated, installation will be a snap, but novices will have to follow the easy-to-read manual.

hBudget is written in compiled *dBASE II* language, so all *hBudget*-generated data files can be shared and processed by such programs as *dBASE II* and *III*, *1-2-3*, and *Symphony*. The program features an on-line pop-up calculator for easy entry of amounts and offers an extraordinary degree of flexibility in data entry. One data disk can store up to 1,300 transactions—approximately 1½ years of financial records for a family of four. *hBudget* tracks 31 user-defined accounts—such as checking, savings, IRA, money market, and real estate—each of which can be defined as a checking account for transaction processing. It also allows you to define up to 36 expense/income categories, such as children's allowances, clothing, interest income, and asset appreciation.

One of *hBudget*'s nicest features is that you can use its cash flow projection capabilities to do "what if" studies. For example, you can enter hypothetical mortgage loan payments with a certain monthly payment and study the effects on your financial situation next month, next year, or even several years from now. Or you can even try to see if you can realistically afford a 35-foot sailboat, a new car, or a vacation to Aruba.

For the security conscious, *hBudget* provides a two-level password system to protect the confidentiality of your financial data. The system isn't foolproof, however, so the best protection is to lock up your disks. If you should forget the passwords, you lose access to the program and must contact Oak Park Software for help. To protect yourself from computer failure, *hBudget* automatically generates a book of records—a report detailing your maintenance session that you can print out immediately or store as a separate file on-disk. In addition, *hBudget* offers 11 types of printed reports such as account balances on a specific date, a cash flow projection to a specific date, and a budget for a specified month. The program will not print checks or address envelopes, however.

Is *hBudget* for you? The bottom line is time. If you have the necessary time to devote to organizing and maintaining your records, buy *hBudget*. In the long run, the ease with which you'll be able to track your financial condition may make the initial effort worthwhile. If, however, you're the type who always takes the easy way out and lets things go for weeks and months at a time, maintaining *hBudget* files may be more of a headache than an aid. ■

PC MAGAZINE FACT FILE

hBudget
Oak Park Software Inc
P.O. Box 710
Milwaukee, WI 53201
(414) 797-7911
List Price: $155
Requires: 256K RAM, two disk drives, DOS 2.0 or later, dot matrix printer.
In Short: A comprehensive accounting program for planning and tracking personal financial transactions.

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hBudget *includes five disks in an IBM-style binder.*

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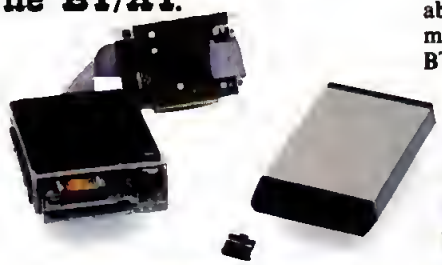

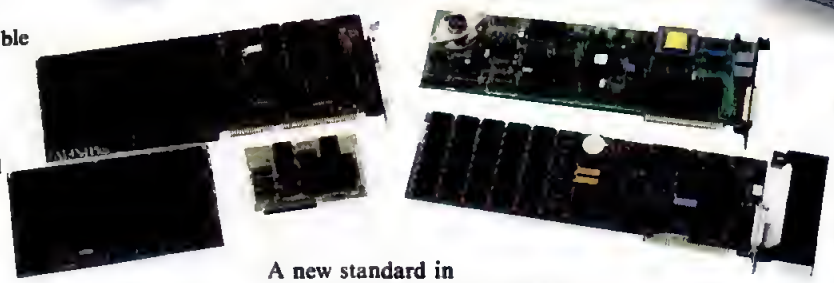

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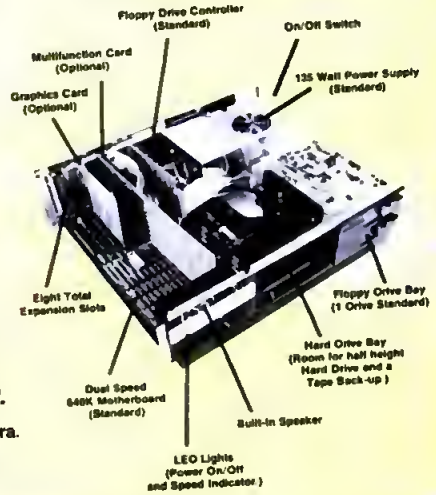

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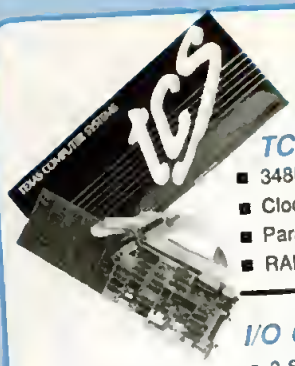

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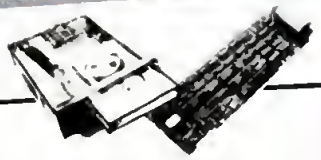

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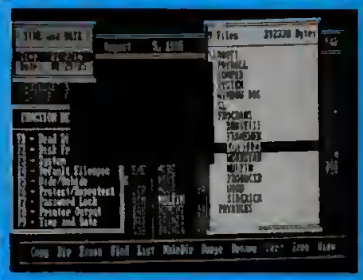

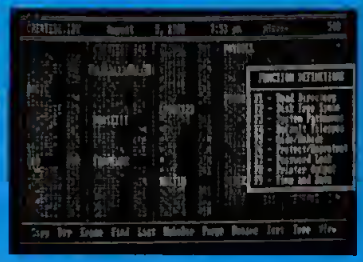

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Find any file on hard disk	Yes	No	No	Yes	Yes	No
Copy, erase or rename file	Yes	No	Yes	No	No	Yes
Selective file erase command	Yes	No	No	Yes	Yes	No
Batch file copy or erase	Yes	No	No	Yes	No	Yes
Change file attributes	Yes	No	No	Yes	Yes	Yes
Change default subdirectory	Yes	No	Yes	Yes	Yes	No
Create new subdirectories	Yes	No	Yes	Yes	No	No
Display Visual TREE	Yes	No	No	Yes	Yes	Yes
Check free space on drive	Yes	No	Yes	Yes	Yes	Yes
Display file in ASCII format	Yes	No	No	Yes	No	Yes
Display file in HEX format	Yes	No	No	Yes	No	Yes
Check or set time and date	Yes	No	Yes	No	No	No
Send printer control codes	Yes	No	No	No	No	No
Select default printer	Yes	No	No	No	No	No
Password lock computer	Yes	No	Yes	No	No	No
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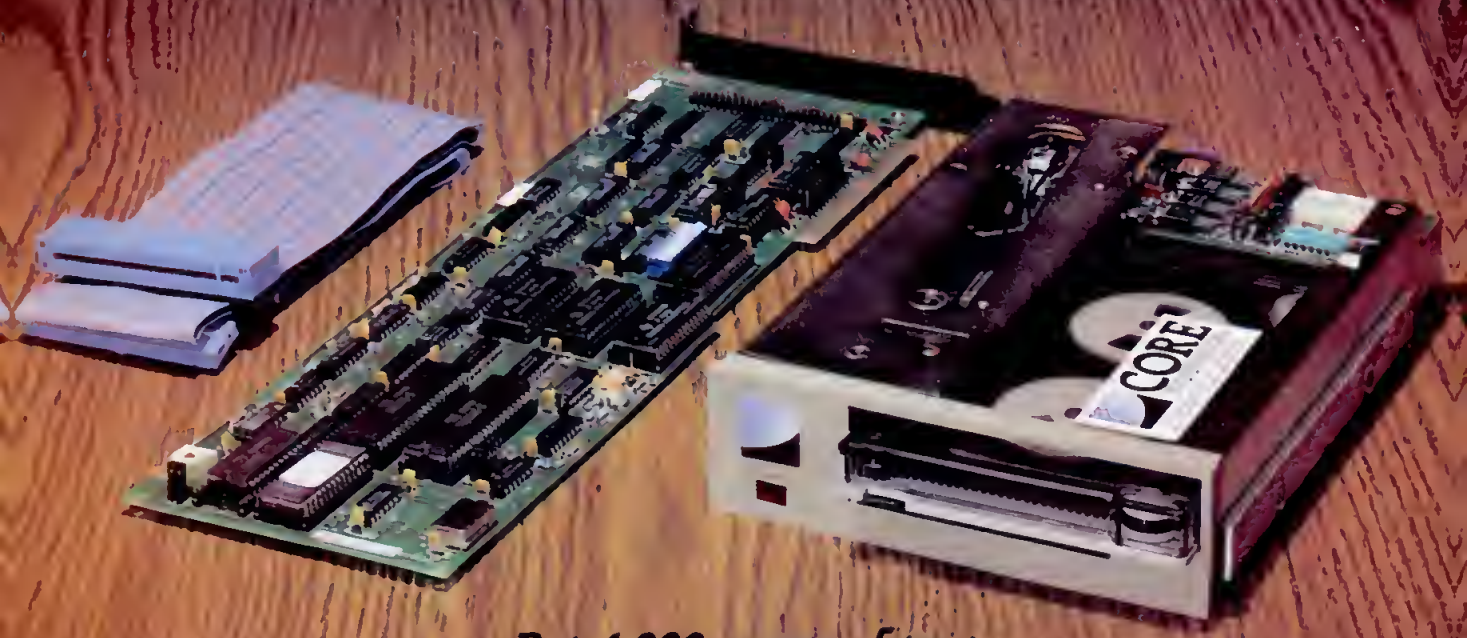

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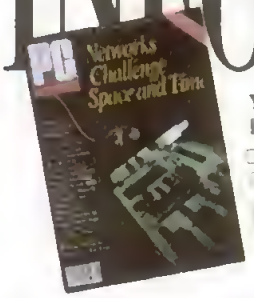

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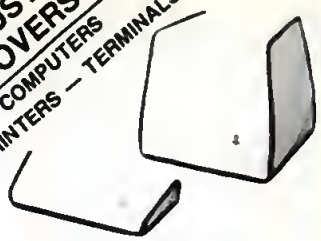

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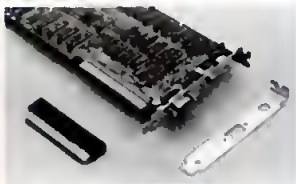

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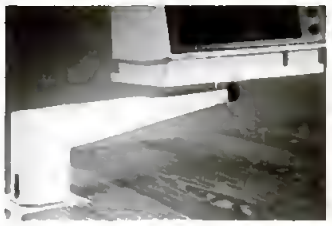

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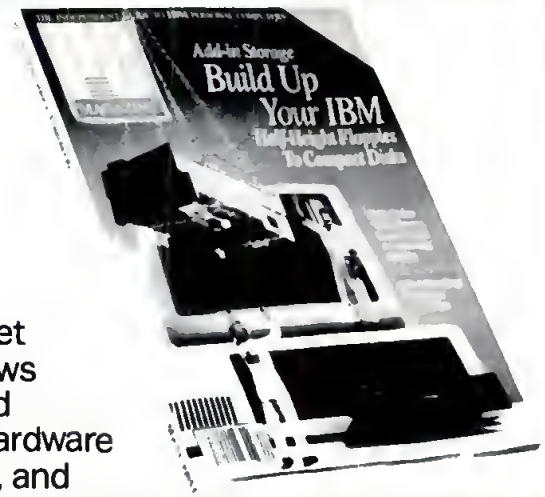

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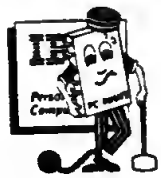

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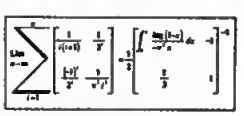

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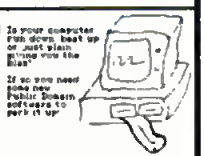

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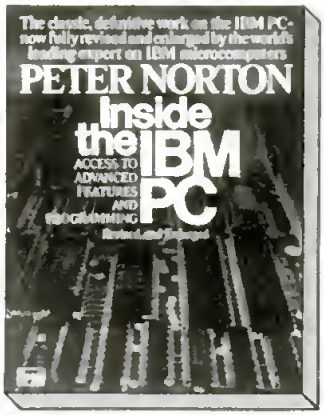
■ BOOK REVIEW ■ CHARLES PETZOLD



HELPFUL (AND NOT SO HELPFUL) HINTS

Not every book with "power" in its title can help advance you to power user status. Those with "Norton" on their title pages have a better chance.

For some people, enhancing productivity on the PC simply means mastering all the features of applications programs. But enhanced productivity also results from gaining a proficiency and fluency in the more arcane (and sometimes undocumented) features of DOS. Sometimes by synergistically combining seemingly unrelated features or noticing something no one else has before, a PC user can devise a simple way to make PC life a whole lot easier for everyone. This is the whole idea behind the often helpful tricks, shortcuts, and utilities that regularly appear in *PC Magazine*'s popular User-to-User, Power User, PC Tutor, and Programming/Utilities columns.

PC SECRETS James E. Kelley has been clipping and collecting these little treasures for years. He has rewritten them, polished them up, and compiled them under the title *PC Secrets: Tips for Power Performance*. The author admits that this book contains adapted material and acknowledges his debt to (among others) three of *PC Magazine*'s current editors.

PC Secrets is first an introduction to the BASIC and DEBUG tools needed to start using these tricks and shortcuts. It is also a compendium of little batch files and BASIC and assembly language programs to redefine your keyboard, help send control sequences to your printer, put a border on your color display, sort directory listings, and set up system menus. Along the way, Kelley covers more-practical problems, such as setting the DIP switches in the PC and getting your printer to work.

ERROR TRAPPING Unfortunately, the book is sprinkled with errors. Kelley's first illustration of using BASICA omits the quotation marks around the filename in the SAVE and RUN statements (page 4). He frequently uses a period for a REM statement in batch files but doesn't get around to mentioning until page 99 that it won't work right under DOS 3.*x*. He classifies a parity check as a power-on hardware check (page 23). His file "undelete" procedure (page 34) changes only the directory entry and not the FAT table, and hence won't work on anything larger than a tiny file. His many programs that intercept Interrupt 9 (the keyboard interrupt) are hardware dependent. He suggests using DISKCOPY with a RAMdisk (page 97), when any RAMdisk program that works with DISKCOPY shouldn't be used under DOS 2.0 and later.

I won't claim that the back pages of this magazine have been utterly free of errors.

■ Some chapters of Things the Manual Never Told You will probably be more valuable if you read them before you buy any hardware or software.

Eventually the right methodology—and more importantly, the underlying principles—are subsequently uncovered, discussed, and brought to light, making everybody a little smarter. The problems that I see in *PC Secrets* indicate to me that Kelley is not yet at the point where he understands these underlying principles.

In the introduction to *PC Secrets*, Kelley compares his collection of PC tips with his wife's mania for collecting recipes. I hope that she has a little more discrimination than he does in noticing obvious problems and doing something about them. Otherwise, the Kelley household must sit down to some very unusual meals.

NOT IN THE MANUAL The Boston Computer Society's *Things the Manual Never Told You: Tips, Techniques, and Shortcuts from the Nation's Largest User Group* sounds like it's on much the same level as *PC Secrets*, but it's really not. Some chapters of *Things the Manual Never Told You* will probably be more valuable if you read them before you buy any hardware or software. Others may be helpful after you've been using your PC for a while. Still others get into more advanced spreadsheet and database work. The book, as you may expect, is almost like an extended user group meeting: Anything goes!

The several introductory chapters devoted to the basic concepts of word processing, spreadsheets (concentrating mostly on *1-2-3*), and database management programs (mostly *dBASE II* and *III*) are helpful. If you have been using a word pro-

cessor for a while, the chapter on word processing will not do you much good. If you will soon be buying a word processor for the very first time, it may well prove to be essential.

DOS TIPS Other chapters cover things you may have missed the first time through the DOS manual and never got back to, such as the DOS editing keys F1 through F6, the parameter flags for the DIR command, piping with SORT and MORE, and batch files.

A chapter entitled "Advanced W.P. Tips" covers (among other things) the process of getting a piece of a spreadsheet into a word processing document. Although the idea behind this manuever is pretty simple, I can't recall ever having seen someone discuss all the steps involved in it. So, if this process is a mystery to you, *Things the Manual Never Told You* will also be of help here. The chapter on spreadsheets discusses spreadsheet organization and macros and may be valuable even to relatively advanced spreadsheet users.

The margins of the book contain numbered "Tips" (77 in all), but they're mostly things like "Don't think you're stupid if

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you can't read the manual" and "If you are thinking of adding a hard disk to your 1982 PC, Version 1, you need a ROM update kit."

Like a user group meeting, *Things the Manual Never Told You* may or may not yield anything useful for you. You may sleep through some chapters and be fascinated by others, and sometimes an off-the-cuff remark may provide more insight than a 20-page example. Unlike a user group meeting's, however, the book's topics can be looked over before you buy. Do so. Because this book is such a hodgepodge and has something for people of many levels of PC expertise, I'll let you be the judge whether it's right for you.

INSIDE THE PC Peter Norton's original *Inside the IBM PC* changed my life and, I'm sure, the lives of many others. The book is one of the few real classics of IBM PC literature. Back in those not-so-distant days, many people knew in theory that the IBM PC was a machine based on "open architecture." Peter Norton was the first to prove it to be true. *Inside the IBM PC* demonstrated that IBM—a company not previously known for a jolly nature—had given birth to a computer that could actually be fun.

What's more, *Inside the IBM PC* showed that exploring the hardware and software internals of the PC was not only a fascinating recreation but makes you better equipped to deal with the inevitable problems that crop up when using a computer.

The *Inside the IBM PC Revised and Enlarged* is radically different from the original. Some of the early fans might be disappointed, but they shouldn't be. The true successor to the original text is Peter Norton's recent *Programmer's Guide to the IBM PC* (reviewed in *PC Magazine*, Volume 4 Number 24). The new *Inside the IBM PC Revised and Enlarged* is a more-basic introduction that covers in the early chapters topics like bits, bytes, and hexadecimal notation. It is more informational, less technical, and less oriented toward programming.

TECHNICAL BACKGROUND Norton does not ignore that technical aspect altogether. The revised edition is punctuated with "Technical Background" sidebars that amplify the main text. But it's clear that in this book he's writing for people who are interested in how DOS stores files on the disks, for instance, rather than people who are going to poke bytes into the disk parameter tables to see what happens.

In moving the heavy programming-oriented material to his *Programmer's Guide*, Peter Norton has made *Inside the IBM PC Revised and Enlarged* an excel-

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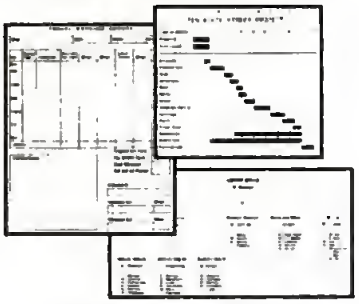

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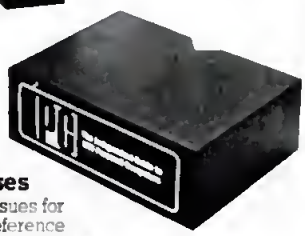

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lent comprehensive survey of the various components of the hardware, the BIOS, and operating system of the PC. With the revised *Inside the IBM PC* a whole new, relatively less-technical audience can discover the joys of Norton's writings.

RECENT MATERIAL Having experience with the inevitable time lags of publishing, I was quite surprised to see some brief discussions of recent developments in this book, such as the release of *Microsoft Windows* and the Lotus/Intel/Microsoft expanded memory specification. I also enjoyed Norton's amusing little PC history stories scattered throughout the

■ Peter Norton's Inside the IBM PC is one of the few real classics of IBM PC literature.

text, like why the PC's operating system is Microsoft's MS-DOS instead of Digital Research's CP/M-86: "Gary Kildall, the man who created CP/M, intentionally kept IBM's representatives waiting, and fuming, while he flew his plane for hours in the sky overhead...while Bill Gates, head of Microsoft...donned his rarely worn business suits for meetings with IBM to demonstrate that he was serious about doing business with them.... With DOS as the dominant operating system for the PC family, CP/M's fortunes took a nose dive. Gary Kildall's flight led to a crash landing for his operating system."

If you liked the original *Inside the IBM PC*, get Norton's *Programmer's Guide to the IBM PC* for more of the same. It's more methodical and encyclopedic, even if it misses some of the freewheeling fun of the earlier text. If these two books seem too technical, but you'd still like a well-informed, well-written, detailed, and uninsulting tour through your computer, the new *Inside the IBM PC* is ideal. ■

Charles Petzold is a contributing editor of PC Magazine.

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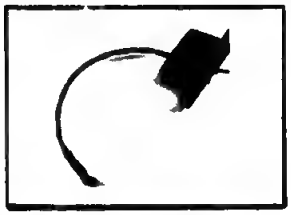

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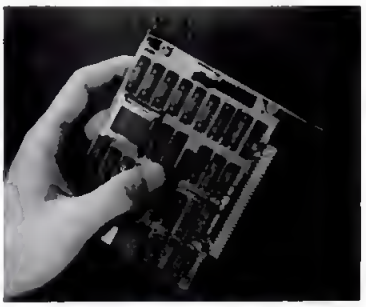

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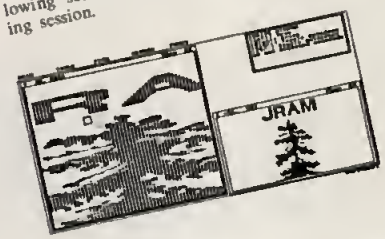
The font editing program allows you to edit characters in existing fonts or create new characters or logos from scratch. Logos can be created and then printed just as any other character. An optional font editing program provides an enlarged display, powerful editing commands and is compatible with the Microsoft Mouse. The following screen depicts a character editing session.



Font Variety

SoftCraft's *Fonts Are Available In Many* Different Styles And Sizes

Formatting Power

Special formatting commands that deal with proportional fonts and different height fonts help in setting tables and math formulas. The following equation is an example using fonts from the SoftCraft font library.

$$\pi(n) = \sum_{k=2}^{n} \left\lfloor \frac{\phi(k)}{k-1} \right\rfloor$$

Your Options

Fancy Font: Use with any word processor. Create an ASCII file and use Fancy Font formatting commands.

Fancy Word: Use with Microsoft WORD. All of WORD's formatting commands are supported; no other commands are required.

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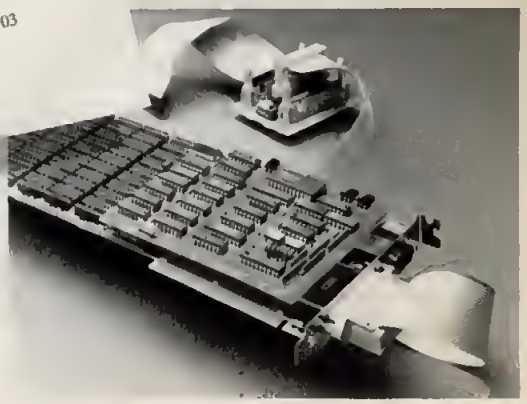
JLASER is the powerful, economical, and efficient solution to all your laser printer problems.



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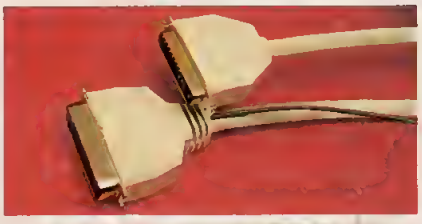

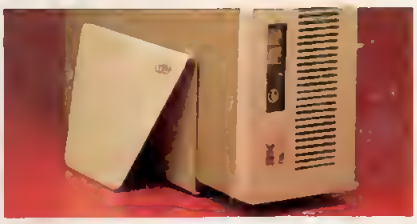

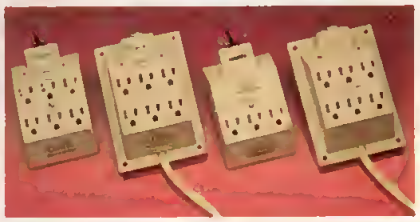

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